Please note, these minutes are draft and are awaiting final acceptance in the next Environmental Health Subcommittee Meeting

WEST CUMBRIA SITES STAKEHOLDER GROUP
ENVIRONMENTAL HEALTH SUB-COMMITTEE

MEETING 70 OF THE EHSC
HELD AT CLEATOR MOOR CIVIC HALL
ON 27 November 2008.

Present:

Professor John Haywood	Chairman
Professor Steve Jones	Vice Chairman
Mr Nick Atherton	Secretary
Mr Ron Hargreaves	
Dr John Astbury	Cumbria Primary Care Trust
Mr Stephen Tandy	Environment Agency
Mr Thomas Greer	Copeland Borough Council
Mr John Cain	Copeland Borough Council
Mr Jim Desmond	Sellafield Ltd
Mr John Titley	Environment Agency
Mr Stuart Conney	Food Standards Agency
Dr Kins Leonard	Centre for Environment, Fisheries and Aquaculture Science
Mr John McCord	Sellafield Ltd

1. **AGENDA ITEM 1. Chairman's introduction**
2. The Chairman opened the meeting by welcoming those attending, including representatives of the public and press. There were a number of apologies including Dr Susan McCready-Shea from the NII and Dr Graham Hutson from the Parish Councils.
3.
4. **AGENDA ITEM 2. Minutes of Meeting 68**
5. Mr Tandy gave a number of amendments to the minutes of the previous meeting.
   Line 91 was changed to clarify that SL had appointed WSC.
   Line 109 changed to say that surface sampling was the most credible scenario. The last two sentences were deleted.
   Line 115 clarified that there would be a multi agency decision.
   Line 118 changed to clarify that the concern was aqueous effluent management and that future enabling work to remove entrained solids were at a plant level.
   The minutes were accepted subject to the amendments
6. Mr Tandy clarified that the EA organised multi-agency review of particles which the meeting had been informed was scheduled for September 2008, had actually taken place in November 2008.
7. Mr Tandy also advised the meeting that the EA had recently hosted a visit from a member of the United States Environmental Protection Agency (EPA). The US EPA managed to get 100% greater attendance by members of the public for meetings held in the evening rather than during working hours.
   It was noted by committee members that evening meetings had been previously discussed but never tried.

8.
9. **AGENDA ITEM 3. Radioactivity in Food and the Environment Report 2007**
10. The Chairman noted that the production of the report had been delayed this year and had not been sent out to members prior to the meeting as usual. Copies would be sent out once the report was published. Any member of the public who wanted a copy of the report were encouraged to leave their name and address details.
11. **Agenda Item 3.1 Terrestrial Monitoring, presented by Mr Stuart Conney**
12. Mr Conney advised that handouts were available which included the section of RIFE discussing the Sellafield area and associated data tables. For reference these have been attached to the minutes.
13. The RIFE report details the environmental monitoring carried out around Sellafield in 2007. It includes calculated doses to local consumers and compares these to others sources of dose.
14. The RIFE report is a collaboration between the Environmental Agency in England and Wales, the Northern Ireland Environment Agency, the Scottish Environmental Protection Agency and the Food Standards Agency (FSA).
15. The FSA carries out terrestrial monitoring around Sellafield and Drigg. This includes the collection of milk samples from local farms on a weekly basis. These are bulked into weekly, monthly and quarterly samples and scheduled for 744 analysis. The FSA also collect 74 terrestrial non-milk samples (crops and animals etc) These are scheduled for 609 analysis.
16. A slide showing the West Cumbria sampling points was shown to the committee (Fig 1). It was noted that there was limited sampling on the fells, due to the lack of food production.
17. The measured levels of radioactivity in food are used in the dose assessment alond with information from surveys to identify the amount of each food type eaten. A dose coefficient from the International Commission of Radiological Protection is used in the assessment to factor in the amount of harm to the human body.
18. It was noted that the limit for public exposure to all artificial sources of radioactivity, excluding doses from medical practices is 1000 μSv per year.
19. Annual doses to local consumers at Sellafield from terrestrial sources was calculated as 23 μSv. It was clarified that these were local consumers consuming above-average amounts of locally grown food and milk.
20. A number of other common sources of dose was given to put this result into context as follows:
    - One dental x-ray = 5 μSv
    - Annual dose to local terrestrial food consumers at Sellafield = 23 μSv
    - Return flight London to Sydney = 160 μSv
    - Annual dose from natural radionuclides in food & water = 250 μSv
    - Annual dose limit from artificial sources = 1000 μSv
    - Annual UK dose from all natural sources = 2230 μSv

21. The work that the FSA are undertaking to monitor the impact from Chernobyl was also presented to the meeting.
    Sampling still carried out in Cumbria (9) , Scotland (6) and Snowdonia (351 farms)
    Sheep are monitored individually for "Mark & Release" Scheme
    Farms are controlled under a Food and Environment Protection Order on Lake District Fells.
    Farms are released from controls after full survey. Sheep need to be under 300 Bq/kg for farms to be released from controls.
    FSA expect this to continue for the foreseeable future.
22. CORE queried the amount of radioactivity found in soils on Corney Fell and proportions which can be attributed to weapons testing and Selafield discharges. It was noted by members of the meeting that a large proportion of the radioactivity could be attributed to natural background, with some from Weapons testing and Sellafield. It was becoming harder to distinguish the weapons testing element due to the decay of shorter half-life isotopes.
23. CORE queried how the RIFE report could show the effect of historical sources which is not seen in environmental monitoring. It was noted by the committee that the RIFE report includes data from analysis of foods.
24. CORE asked what the effect of an extended Thorp and Magnox shut down would have on the dose. Mr Conney advised that it would not be significant as most of the dose is from historical sources and that it would be even less in the terrestrial environment due to limited accumulation.
25.
26. **Agenda Item 3.2 Sellafield Marine Monitoring 2007, presented by Dr Kins Leonard**
27. It was noted that the RIFE 13 report shares the 50th anniversary of the Euratom Treaty and the Windscale Fire.

28. A number of improvements in the RIFE 13 report were noted. These included
    - Total dose assessments - nearing completion in terms of site coverage (23 sites - Berkeley, Oldbury, Harwell, Bradwell)
    - Updated habits information (Sellafield, Berkeley, Bradwell, Dumfries and Galloway, Harwell, Hunterston, Oldbury)
    - New Figures
    - Sampling maps for Dounreay (Fig 3.2) & Winfrith (Fig 3.3)
    - Aquatic dose trends for Central UK (Fig 4.3)
    - Irish Sea dose map for recreational pathways (Fig 2.23) – residents beaches/intertidal areas
    - Whitehaven seafood consumption dose trends (Fig 7.4)
    - 10 year time trends at Sellafield this year (previously 25 y)

    Chapter 2 Nuclear fuel production/reprocessing
    - New assessment introduced for Sellafield – recreation by residents and tourists (Fig 2.23)

    Local residents - beaches:
    - Cumbria 0.010 mSv ;
    - Lancashire & N Wales 0.006 mSv

    Local Residents – intertidal:
    - Sellafield 0.019 mSv ;
    - Lancashire 0.007 mSv
    - North Wales < 0.005 mSv

    Typical Tourist (including consumption rates)
    - Visiting the coast of Cumbria < 0.005 mSv

    Chapter 7 Industrial and landfill sites
    - New Whitehaven seafood consumption dose trends (Fig 7.4) from naturally-occurring radionuclides
    - Dose variation (0.28 mSv 2007) reflect changes in both concentrations (Po-210) and consumption rates of lobsters and molluscs
    - Additional exposure from fish and shellfish consumed from artificial radionuclides (0.24 mSv, combined 0.52 mSv)

    Some of these improvements were to address comments from the EHSC meeting last November.
29. Sellafield habits surveys are carried out on a 5 yearly basis for terrestrial and yearly for aquatic (as this is the main dose pathway), published as a separate report. The 2007 survey was completed in October having interviewed local authorities and people from Parton to Tarn Bay. The survey recorded information on seafood consumption, occupancy rates and other activities. Approximately 500 observations were recorded.
30. Additional habits survey (EA) to determine the publics' beach activities – exposure to radioactive particles – HPA considered no precautionary actions necessary
31. Graphs of the seafood consumption rates were shown. The rates were largely stable, although there was a slight decrease in the consumption of molluscs.
32. Maps of the sampling locations were shown to members of the committee.

33. Time trends for a number of radionuclides were shown. Each graph showed the Sellafield discharge and the activity concentration found in a number of key species from 1998 to 2007. See Figure 2 to 6 for graphs presented in the meeting.
34. In summary the graphs showed
    - Liquid discharges; H-3, C-14, Co-60, Ru-106 and I-129 lower in 2007
    - Concentrations/dose rates generally similar to those in 2006
    - Tc-99 continued to decline in shellfish – Pu-239/240 in lobster (2007) looks high in 10 year trend (Figure 2.11) - likely environmental scatter as similar to values in 1995 & 1997
    - Local enhancement of C-14 decreased (fish/ shellfish) after discharge lag time
    - Slight reduction in levels of Cs-137/ transuranics elements in finer sediments (Newbiggin and River Mite Estuary) – lowest levels in Ravenglass sediment in 2007, and lower beta dose rates (sediments and fishing gear handling)
    - Small increase in Pu isotopes & Am-241 (historic) in shellfish at selected locations (Sellafield Coastal Area, Whitehaven, Tarn Bay and North Solway Coast).
35. The calculated dose to seafood consumers was shown in comparison to previous years (Figure 7). The slight increase in dose is due the updated habits data.
36. Dr Leonard also presented a summary of recent work concerning the human body retention time of organically-bound tritium (OBT)
    - Uncertainty in dose coefficient for OBT due to poor knowledge of human body incorporation and retention time
    - ICRP use generic 4.2 E-11 Sv/Bq for OBT based on animal data cf. 1.8 E-11 for HTO
    - Most sensitive situation for UK public; fish eaters near Cardiff due to authorised releases from GE plc (albeit low doses : 14 μSv in 2007)
    - Retention study (HPA) using rats eating Cardiff fish (Hodgson 2005) suggested 30% component to retention with body half-time ~100 days. Effect: increase ICRP dose coefficient for OBT from 4.2 E-11 to 6.0 E-11 Sv/Bq
    - CEFAS investigated body retention in human volunteers
    - Using excretion patterns from a small number of volunteers after eating fish containing OBT from Cardiff Bay

    It was noted that only small amounts of OBT are found in the Sellafield area
37. The results were described as follows:
    - Faecal data show most of H-3 had cleared from the gut by ~ day 7
    - Faecal excretion of H-3 was <10% of total
    - OBT in urine also declines over first few days, suggesting rapid incorporation in body, subsequently hydrolysed and excreted as HTO, the major form of urinary excretion.

38. The study had the following conclusions
    - For the food used in this study, total tritium retention half times in the range 4-11 days
    - There appears to be no significant retention component with a greater characteristic half time in this case (Statistical bi-exponential curve fitting of excretion curves)
    - The short timescale could be due to rapid hydrolysis in body tissues of the form of OBT used in this study
    - Implications: Dose coefficient for OBT for current ICRP value of 4.2 E-11 Sv/Bq may be cautious

    In this situation, the value of 1.8 E-11 Sv/Bq for tritiated water may even be more appropriate.
39. CORE asked how the RIFE report can distinguish between the historical radioactivity within sediments and the current discharges and queried why sediment core sampling was not included as part of RIFE? It was noted by the committee that the data is collected from the key species rather than the sediments. There is a lot of information in the public domain concerning the radioactivity within sediments and the pathways to key food species.
40.
41. **3.3 Environmental Monitoring for Sellafield and LLWR, 2007 – Presented by Mr John Titley.**
42. The Radioactive Substances Authorisation status in 2007 was noted as being the same as 2006. The Sellafield sea pipeline has 16 nuclides specified, 2 alpha/beta and 1 for U by mass.
43. A summary of the Sellafield sea pipeline discharges was shown. All of the radionuclides were below the authorised limits. All measured radionuclides, with the exception of Stronium-90 and Caesium-137, decreased from 2006 to 2007.
44. A summary of the Sellafield gaseous discharges was shown. All of the measured radionuclides were less then 20% of the authorised limit.
45. A summary of the LLW disposals from Sellafield was also shown. Again all of the measured radionuclides were below the authorised limits.
46. Agency checks on radionuclides in discharges & disposals in its check monitoring programme. In 2007, this check monitoring included aerial discharges (bubblers & filters) from Sellafield (Magnox Reprocessing & THORP) and liquid effluents from Sellafield (EARP, SIXEP, SETP, Factory Sewer, Lagoon & Laundry) and LLWR
    Check monitoring of Sellafield groundwater sampling was introduced in 2006.
    Solid LLW disposals from nuclear sites was also checked.
47. Sellafield gaseous monitoring was noted to be generally a good comparison and an improvement from previous years. The liquid monitoring was also noted to be a good comparison. However there were slightly more occasions where SL recorded higher results than the EA, when compared to the previous year.

48. Sellafield groundwater results comparison was a new regular programme started 2006 Q3
    - Quarterly check monitoring samples from 5 boreholes
    - Compare with Operator's results
    - Provide reassurance that Operator's monitoring arrangements for borehole water is satisfactory
    - Checks - total alpha, total beta, H-3, Sr-90, Tc-99, and gamma emitters (Cs-137 etc).

    The results were summarised as follows:
    - 120 analytical comparisons carried out in 2007 of which
    - 74% good comparison
    - 4% poor - Sellafield finding higher results than EA
    - 22% poor - Sellafield finding lower levels than EA
    - Majority of the poor comparisons were very low activity samples or only just classed as "poor"
49. Monitoring at the LLWR showed that a lower percentage of results were classed as a good comparison when compared to previous years. It was noted that this was largely due to a smaller number of samples being taken.
50. A summary of the effluent check monitoring was given as follows
    - LGC Teddington began their contract with the EA in 2007 for the analysis
    - We have kept a close eye on comparisons during 2007 due to the change in EA contractor and no major issues or trends have been identified
    - In 2006 there were 19 C-14 discrepancies for gaseous discharge bubbler samples;
    - Reduced to 6 in 2007 - improvements in EA analytical method for C-14

51. The LLW check monitoring included 2 x ISO skips of loose bagged LLW from Sellafield:

    B30/B38/B39 Plants, seized at end of December 2006
    B570 THORP, seized July 2007

    And reference drum tests from
    UKAEA - Winfrith
    Magnox – Berkeley, Bradwell and Hinkley Point A
    BEGL – Dungeness B and Hartlepool
52. Sellafield B30/B38/B39 loose bagged LLW checks showed
    - No non-permitted items present
    - Wastes well within limits
    - Under declaration of radioactivity content by operator.
53. Sellafield B570 Thorp loose bagged LLW checks showed
    - 192 waste packages found but only 178 declared
    - Under-reporting of very low levels of Fe-55 present

54. Results of the on-site drum testing was summarised. This is a blind test with drums provided by EA lab with known sources for analysis on the nuclear licensed site.
    - Winfrith (SGS). All radionuclides were reported but over estimated.
    - Berkeley (SGS). All radionuclides were reported but over estimated.
    - Bradwell (SGS). All radionuclides were reported but over estimated.
    - Hinkley Point A (LRGS) – All radionuclides measured were under-estimated
    - Hartlepool (LRGS) – performed relatively well; slight tendency towards over-estimation of activities
    - Dungeness B (LRGS) – performed relatively well overall; results suggest slight tendency towards over-estimation of activities.
55. The Environment Agency is also responsible for monitoring non-food parts of the environment. This includes sediments, water, seaweed, grass, soil and dose rates. The monitoring is undertaken to ensure the dose limit of 1 mSv/y is not exceeded.

    The Food Standards Agency is responsible for monitoring the foodchain monitoring of fish, shellfish, milk, vegetables and meat ensuring that doses from foods are assessed.

    Results from both organisations are used to assess total dose – compared with dose limit
56. A slide summarising the numbers of measurements of dose, sand and seaweed was shown. Additionally, on the Cumbrian coastline beach strandline monitoring over approximately 50 km was undertaken by the EA. Seawater is sampled at 2 locations in West Cumbria. Radionuclides in surface waters are measured at approximately 10 locations and in gullypot (drain) sediments at 6 locations (5 at Seascale and 1 at Whitehaven)
57. Environmental dose rates for the Sellafield area in 2007 were summaried as follows:
    Average UK background dose rates
        silts 0.07 µGy/h
        sand 0.05 µGy/h
    Highest annual dose rates (2006)
        River Mite 0.18 µGy/h (0.18 □Gy/h)
        Newbiggin 0.16 µGy/h (0.16 □Gy/h)
        Upper River Calder 0.10 µGy/h (0.10 µGy/h)
        Upper River Calder used to have high dose rates (radiation close to the reactors)
58. A graph of the West Cumbria dose rate trended since 1980 was shown. (see Figure 8). The dose has declined significantly since monitoring began. Doses have generally levelled out just above the expected background.
59. A summary of the silt concentrations in the Eskmeals Estuary was given. For all radionuclides shown, the 2007 concentration has decreased from the average of the 1998 to 2006 results.

60. A summary of the radionuclide concentrations in Eskmeal sediments for a number of different radionuclides was given. (see figures 9 to 13). Co-60, Ru-106, Tc-99 concentrations in environment follow discharges closely. Pu-239/40, Am-241 and Cs-137 concentrations in environment (in particular Esk Estuary) don't follow discharges closely. Residue of higher historic environmental burden from 1970s and 1980s continue to affect levels seen. Results are "noisy" with variation from year to year. Am-241 levels influenced by ingrowth from Pu-241.
61. A summary of the non-food doses in West Cumbria were shown and compared to the dose limit of 1 μSv/yr. Both the houseboat dweller in the Ribble Estuary and the Ravenglass nature warden had slightly decreased doses since 2006. A new dose for recreational users on the West Cumbria coast had been calculated and given as 0.01 μSv/Yr. The breakdown of the west Cumbria critical group dose was given, this was split between Sellafield and Rhodia sources.
62. Mr Titley presented the findings of a resurvey of the Esk estuary. The objective was to assess current level of dose rates in the estuary and compare these with a previous detailed survey in 1989.
    The University of Liverpool undertook the study in July and August 2007 in which they surveyed 576 locations in the estuary.
63. The results were summarised as follows. The mean dose rate was 0.14 μGy/h (in 1989 0.23 μGy/h) with a range 0.07 – 0.28 μGy/h (in 1989 0.07 - 0.61 μGy/h)
    Highest gamma dose rates were in similar locations in 2007 & 1989
    It was also noted that the results were broadly similar to the results of the EA monitoring
    The reduced dose rates in 2007 are due to reductions in radionuclide discharges since the 1980s and radioactive decay of the inventory in the Esk Estuary sediments
    Full report of this study (Wood *et al*., in prep) will be published early next year and will also be submitted to a scientific journal.
64. CORE asked when the trigger will be reached for the EA to reconsider the discharge authorisation from Sellafield. It was noted that some limits have a very generous headroom. The EA advised that they undertook a yearly review of the Sellafield authorisation. It was also noted that the Defra UK discharge strategy was currently being reissued following a prior consultation.
65.
66. **4 SL Environmental Monitoring Programme**
67. **4.1 Annual Report on Discharges and Monitoring of the Environment 2007, presented by Mr Jim Desmond**
68. Mr Desmond introduced the results of the SL environmental monitoring programme. The programme samples a number of main pathways from Sellafield discharges to the local population. A slide showing the conceptualisation of these pathways was shown to the committee for both the aqueous and aerial discharges. The locations of the sampling points were also shown to be concentrated along the coast line and farm land near the Sellafield site.
69. The sampling programme was amended so that some of the marine samples were now shared with the EA.

70. The calculated dose to the marine critical group was shown to be slightly decreased in 2007. This was generally due to the decrease in the discharges from the site (Figure 14).
71. The breakdown of the dose by each pathway was shown. The most significant is the consumption of muscles followed by winkles (Figure 15). The nuclides of Amercium-241, Plutonium-241 has been shown to be the main contributors to this dose (Figure 16).
72. The concentrations of Plutonium and Americium in muscles was shown (Figure 17). This has shown that the concentrations have remained relatively constant despite the discharges from the site having decreased. This highlights the environmental burden associated with the historical discharges.
73. The concentration of Technetium-99 in lobsters was shown to mirror the decrease in the discharge of Technetium-99 (Figure 18). The dose from Technetium-99 (from all seafood's) was also shown to have decreased with the reduced Sellafield discharge although there was a slight lag (Figure 19).
74. The exposure of the terrestrial critical group was shown to be predominantly from the consumption of milk (Figure 20), with Stronium-90 being the most dominant radionuclide. (Figure 21).
75. CORE asked if the Sellafield discharges would increase in future years? It was confirmed that the current discharges are low due to a lower through-put at Thorp and Magnox. As through-put is increased so will the discharges.
76.
77. **4.2 Comparison of Findings of Sellafield Ltd, FSA, SEPA and EA annual environmental monitoring reports for 2007 – presented by Professor Steve Jones**
78. A comparison of Sellafield Environmental Monitoring and RIFE reports was undertaken for both marine and terrestrial data. It was noted that there are a number of possible explanations for any differences and there is not always sufficient information to offer an explanation.
79. The SL monitoring programme was similar to 2006 with the sampling concentrated on milk and potatoes for the terrestrial environment. For a number of foodstuffs SL share the data with the RIFE report.
80. An example of the comparison was shown. This was plotted to allow a visual comparrion using the centre line as the 1:1 ratio and a factor of two either side. The factor of two being considered as a reasonable agreement between the data. A factor of five has also been used to take into account that some results are from samples taken from different locations and times (therefore have increased variability.
81. The results for Cs-137 samples compared very well, with nearly all of the results within the factor of 2. The only exception to this trend was the results for Winkles.
82. The results for plutonium alpha analysis also compare very well with the only exception being lobsters. The FSA collected lobster samples from 2 locations with an average Plutonium alpha activity of 0.66 Bq/kg while SL reported a value to 0.21 Bq/kg.
83. Again, lobsters were the only sample which did not agree for the data sets of Amercium-214. The FSA samples gave an average concentration of 6.4 Bq/kg while SL samples and average of 2.0 Bq/kg. It was thought that the difference will be due to the different sample sizes.

84. Technetium-99 analysis for crab, lobster, *Nephrops* and *Fucus* compared very closely. *Phorphyra* and winkles did however show differences likely to be due to the number of samples and the timing of the sample collection as the discharges from the Sellafield site are episodic.
85. Strontium-90 results do not compare very well for Milk and *Phorphyra*. The milk difference is largely due to the sample locations, with SL samples collected from close to the site.
86. Carbon-14 results compare very well for both marine and terrestrial samples.
87. For the marine critical group the dose estimate from SL is lower than that reported by RIFE-13. The reasons for this are:
    - RIFE reporting higher activity concentrations for some radionuclides in certain sea foods than SL.
    - RIFE includes data for samphire, whelk and limpits which are not included in the Sellafield dose calculation.
88. For the terrestrial critical group the SL dose estimate is the same for almost all age categories. The exception is the foetal dose but the difference is minimal.
89.
90. Cefas confirmed that the lobsters were sampled at the same time but that the sample is split in the field. This could result in difference species within each sample which could explain the different results. It may be possible to split the homogenous sample in the future.
91. CORE queried the difference in the sample locations for seaweed. It was confirmed that the original sample locations were chosen as the seaweed was a source of food in the local area. The habits survey had shown that there is little to no seaweed collection for food in the area and the samples are now collected as a good indicator species. The sample locations have been maintained to allow comparisons with historical data.
92.
93. **4.3 Beach Monitoring Update – presented by Mr Jim Desmond.**
94. Beach monitoring has been carried out since the 1983 "Beach incident". A trial of more sensitive equipment was carried out on Sellafield beach in November 2006 and there were 9 "finds". A second location (Braystones) was then monitored and the first "Am-241 find" was made. A full monitoring programme was then required by Agency for 2007/8. This uses the Groundhog Evolution 2 equipment carried on an eight wheeled vehicle (Hillcat) or tracked vehicle (Softrak). The monitoring is carried out by an independent contractor.
95. The Health Protection Agency gave the following advice regarding the risk to the public:
    " *On the basis of information provided by the Environment Agency on 6 July 2007 on the finding of radioactive particles on beaches near the BNG Sellafield site, the Health Protection Agency (HPA) considers that no special precautionary actions are necessary at this time regarding access to or use of these beaches. However, HPA will continue to work with relevant authorities to keep the situation under investigation."*

96. The Environment Agency set a 250 ha monitoring requirement for beaches between Workington and Ravenglass in 2008/09. The progress to date is as follows:
    - 2 x 20 ha St Bees - first session completed April 2008, second session completed October 2008
    - 2 x 20 ha Seascale - first session completed May 2008, second session completed November 2008
    - 30 ha Drigg - completed June 2008.
    - 4 x 25 ha Sellafield - first session completed September 2008 , second session completed November 2008 , third session started November 2008
    - 20 ha Braystones - completed October 2008
    - 10 ha Workington - completed October 2008.
    - 10 ha Allonby - completed November 2008

    The location of the beaches was shown to the committee (Figure 22)
97. The results of the monitoring undertaken between 2006 and October 2008 are as follows
    - 192 ha monitored during trials and 2007/8 programme
    - 115 ha monitored to date in 2008/9 programme.
    - 446 finds to October 2008 - average 1.5/ha. (260 stones.
    - 186 particles (<2mm).)
    - 344 finds located by Cs-137 (i.e via initial Cs-137 alarm).
    - 41 finds located by Am-241 (i.e via high background alarm).
    - 9 finds located by Co-60 (i.e via Co-60 alarm).
    - 52 finds located by combined initial alarms.
98. The committee was shown a table of the finds for each radionuclide (Figure 23) along with a supporting location diagram of the finds along the Sellafield beach (Figure 24). It was noted that the find locations are largely centred on the route of the Sellafield sea discharge pipe with some drift north.
99. Two figures of the 2007/08 survey and 2008/09 survey of St Bees beach were shown to the committee. It was noted that the 2007/08 survey located 6 finds while the follow-on survey only 3. The resurvey had also undertaken some low water monitoring to allow a full beach profile to be completed.
100 The key end point of the laboratory analysis is gut transfer factors for Pu/Am particles. The analysis includes in-vitro simulated gut dissolution (National Physical Laboratory) and in-vivo (rat) gut transfer (Health Protection Agency). Results from rat experiments are expected end of November.
101 All finds are currently being monitored during retrieval and then subjected to gamma spectrometry in the Sellafield laboratory. Sellafield has agreed a further analysis protocol with the Environment Agency and this is being applied to a selection of the finds (15 alpha rich, 24 beta rich, 12 stones). The analysis is being carried out by National Physical Laboratory and Health Protection Agency (rats). The analysis of alpha rich finds is planned for completion at the end of November 08. The analysis of the beta rich will be complete at the end of December 08. The analysis of stones will be complete at the end of March 09.

102 Interim conclusions are that particles or activity were discharged to the sea pipelines pre-1984 (400 micron strainers fitted). The removal of the former sea pipe from the beach was a significant source. The find rates are declining.

103 The EA asked what the main improvements were for the 09/10 monitoring programme?. SL had retendered for the monitoring of the beaches and this process had brought a number of improvements including an improved detection for Americium finds by use of a sodium iodine detector, the site specific calibration of the monitoring equipment and improved efficiency for Strontium detection by the detection of Bremsstrahlung radiation.

104 CORE asked if the Ravenglass area was to be included in the programme? The solid areas which allowed access for the vehicle would be included in discussions with the EA as would the potential for hand held surveys for areas where vehicle access was not possible. Other survey methods are also under consideration.

105 The FSA also asked if subsea monitoring had also been considered. SL has been working with Dounreay to develop this area but that the equipment would be unlikely to be of use at Sellafield. More work will be done in this area in 2009.

106

107 **5 Sellafield Groundwater Monitoring Status Report – Presented by Mr John McCord.**

108 The regulatory drivers behind the groundwater monitoring programme were explained along with the methods Sellafield Ltd use to meet these requirements. The results of the monitoring programme are published annually and a copy of the report is made publicly available. The monitoring provides information to improve the conceptual hydro-geological model of the Sellafield site

- Time-series water level data
- Geochemical information impacting contaminant transport (e.g. colloids studies)

It is also used to facilitate planning and prioritisation for future remedial actions

109 In 2005, a risk evaluation for off-site risk from groundwater was completed. This utilised the most current site conceptual models (hydrogeology, source term, and biosphere) and incorporated consistently conservative assumptions (e.g. assumptions that would lead to increased risk) and assumed no on-site intervention
The risk was calculated for the most exposed critical groups – exposure is from groundwater discharge along the coastal area adjacent to Sellafield (fisherman and bait-diggers)
Calculated peak risk was significantly below the recommended intervention level and occurs approximately 3,000 years into the future

110 A map of the regional groundwater elevation was used to show the direction of groundwater flow. The movement of groundwater was generally from the north east to the coast (south west). It was noted that there are a number of factors on the site which could influence the groundwater flow over a short distance such as the presence of buildings and drains. The speed of movement of each contaminant was also shown to differ with tritium moving fastest and plutonium slowest. This is due to the way that the nuclides interact with the soils and rocks.

111 The Radioactive Substances Act sampling programme includes
- 146 boreholes and 226 individual piezometers
- 49 radionuclide analysis groups
- sample variable schedule
- approximately 1,300 samples collected

For the site Pollution Prevention Control permit the sampling includes:
- 28 boreholes
- 21 non-radiological contaminant analysis groups
- quarterly sample schedule
- 2008 start with 3 rounds of quarterly sampling completed.

112 Evaluation of sample data that exceed the specified "trigger level" is carried out through the year and reported to the EA. A site overview and annual reporting is also carried out, this includes
- alpha-emitting radionuclide concentration distribution (uranium-alpha, plutonium-alpha, neptunimum-237, americium-241, and radium-226)
- beta-emitting radionuclide concentration distribution (strontium-90, potassium-40, cobolt-60, ruthenium-106, antimony-125, and caesium-137)
- weak beta-emitting radionuclide concentration distribution (tritium, technecium-99, carbon-14, chlorine-36, and iodine-129)

Identification of significant year-to-year changes

113 In 2007/08 sampling period, 48 groundwater samples had reportable increases in radionuclide concentrations. Of these 30 samples were judged to not represent a change in groundwater concentrations. 9 samples were assessed to represent a potential significant increase groundwater concentrations (~ 4% of the individual sample points) and 9 samples were waiting on lab confirmation and/or follow-on lab analytical results prior to in-depth data comparisons. Examples of the exceedence evaluations were given. All samples that indicated a potential increasing trend were found to be related to historic contamination (i.e., not indicative of a new leak).

114 Average Total Alpha activities in Sellafield Groundwater from April 2007 – March 2008 were shown to the committee. It was noted that boreholes with elevated concentrations were mainly concentrated in areas of known historic leaks-to-ground. The contamination was shown to be dominated by uranium with much lesser plutonium, neptunium-237, americium-241, and radon-226. The majority of groundwater samples are below the limit of detection (0.03 Bq/l). WHO safe drinking water guideline value for Total Alpha (0.5 Bq/l) was exceeded in 6 boreholes.

115 Average Total Beta activities in Sellafield Groundwater from April 2007 – March 2008 were shown to the committee. The majority of boreholes that exceed World Health Organisation drinking water guideline values are located in areas of known historic leaks-to-ground and disposals. A number of boreholes located to the south and south west of Separation Area also exhibit concentrations that exceed WHO safe drinking water guideline values. Strontium 90 is the dominant beta emitting nuclide with the distribution across site mirroring Total Beta.

116 Elevated tritium activities are found within Separation Area and in a south westerly direction towards the coast. Samples from 3 boreholes located to the south west exceed the WHO safe drinking water guideline value of 10,000 Bq/l. The majority of groundwater samples contain average annual Technetium-99 concentration of approximately 0.5 Bq/l. Samples from 7 boreholes located to the southwest exceed the WHO safe drinking water guideline value of 100 Bq/l.

117 CORE asked if it is possible to distinguish between historical and new groundwater contamination? It was noted that there had been a lot of work gathering information of previous leaks from plants and this has been used to develop the monitoring programme. The monitoring is also used as a form of leak detection to identify any new leaks. The Land Quality team also input into the plant leak detection.

118 CORE noted that the maps shown to the committee were spot maps, would it be possible to show plume maps? There is a lot of uncertainty in the production of plume maps and prediction methods which could be misleading.

119

120 **6 Items of Environmental Interest – Presented by Professor Steve Jones**

121 The ICRP have published recommendations. The HPA have consulted on their advise for the application of these recommendations. Two are close to the interests of the committee. The ICRP have recommended a dose limit from new build nuclear stations is set at 0.15 µSv year. The current recommendation is 0.3 µSv/y from an individual source. The HPA have recommended that the dose limit for all new sources should be set at a the new level of 0.15 µSv/y.

122 Land contamination and the risk associated with particles has no clear advice. The HPA have consulted to ask if should advise is required.

123 It will be a long process to get the recommendations into UK legislation. However the HPA recommendations would have an immediate effect.

124 CORE noted that there had been some controversy in Germany regarding leukaemia clusters around nuclear sites. It would be interesting to get an update on the UK based research into this matter.

125

126 **7 Works update – Presented by Mr Jim Desmond**

127 Variation to RSA authorisation issued 14/11/2008 for a temporary increase in the plant limits for aqueous discharges of Caesium-137 and alpha and beta emitting radionuclides from Thorp Receipt and Storage pond. This was required in order to increase the pond purge in order to remove an increasing inventory of chloride from the storage pond as soon as reasonably practicable in order to mitigate the corrosion risk to AGR (Advanced Gas-Cooled Reactor) fuel.

128 THORP reprocessing operations are on-going with approximately 86 tonnes sheared since April.

129 Magnox reprocessing is currently in planned shutdown.

130 WVP line 3 is currently on-line with line 1 due to return to production in November. Container production is on schedule to meet annual targets.

131 HALES Evaporator C is currently off-line due to shutdown in Magnox reprocessing. Evaporator B has been undergoing trials following re-start.

132 CHP plant continues to operate with reduced stack heights. Enhanced NOx monitoring is now being carried out monthly, and the measured levels continue to be below predicted values and remain well within acceptable levels. Replacement stacks are currently being procured.

133 There was been an increase in Aerial emissions of Antimony-125 from FHP as a result of a more than usual amount of high burn-up fuel being decanned. This resulted in the site quarterly notification level being exceed in June, July and August. Discharges are now returning to normal levels, and there is no threat to authorised limits.

134

135 **8 Consultation Responses**

136 Consultation responses for the NDA consultation on a 'Framework for Sustainability and Environmental Assessment for Geological Disposal' and an EA Consultation on 'Operator Self-Monitoring of Liquid Effluent Flow for Nuclear Sites' were presented to the committee and passed without any amendment. For both cases the reasons for the consultations were queried as the questions were very focused allowing only limited room for a response.

137

138 **9 Election of Chairman and Vice Chairman**

139 Both the current chair (Professor Haywood) and Vice chair (Professor Jones) agreed to stand for re-election. Both were re-elected in a unanimous vote.

140

141 **10 Press release**

142 As the RIFE report had not seen published no press release had been prepared prior to the meeting. It was agreed that the Chairman would submit a press release and a copy would be attached to the minutes (See below)

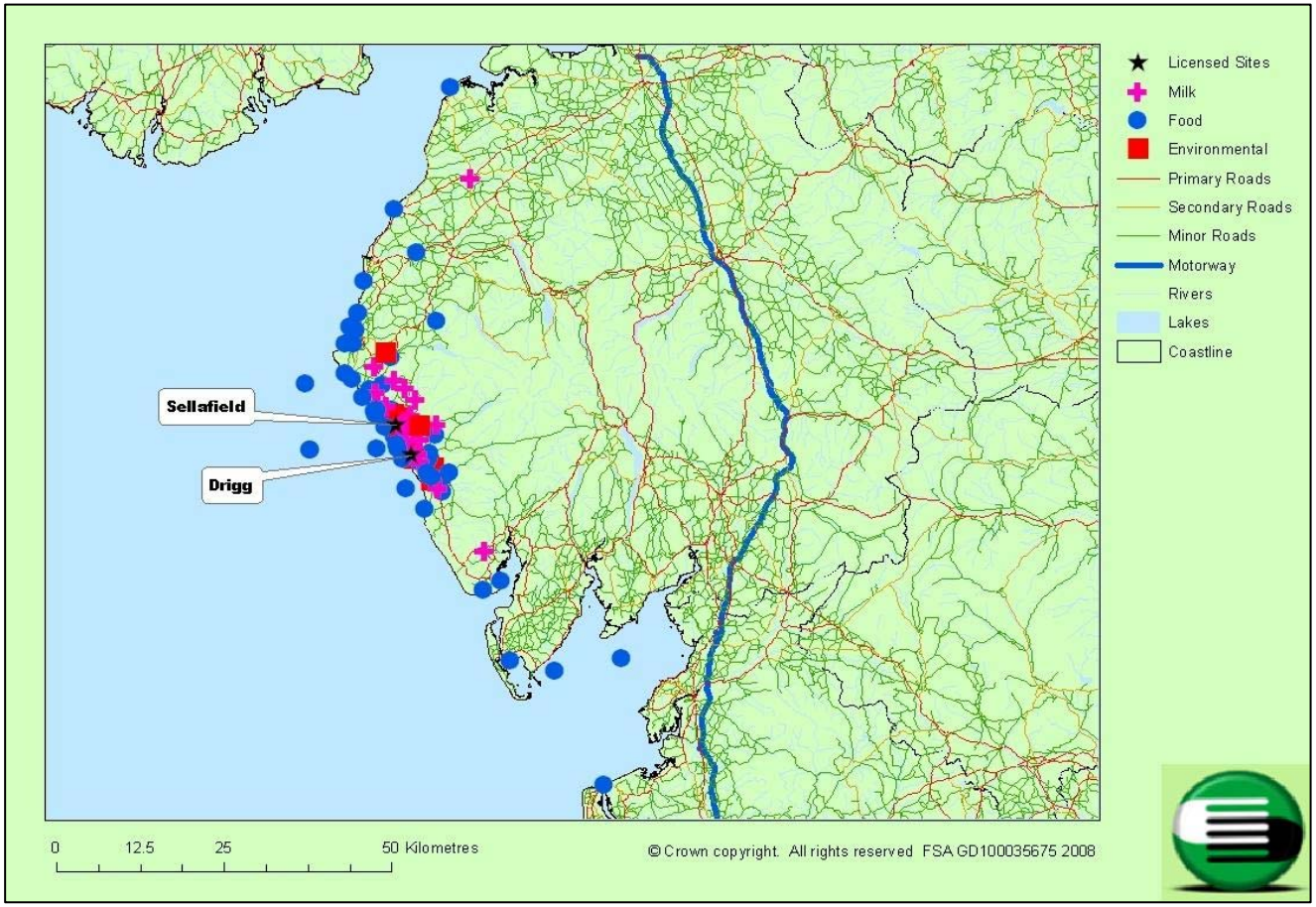

Figure 1 FSA sampling locations in West Cumbria.

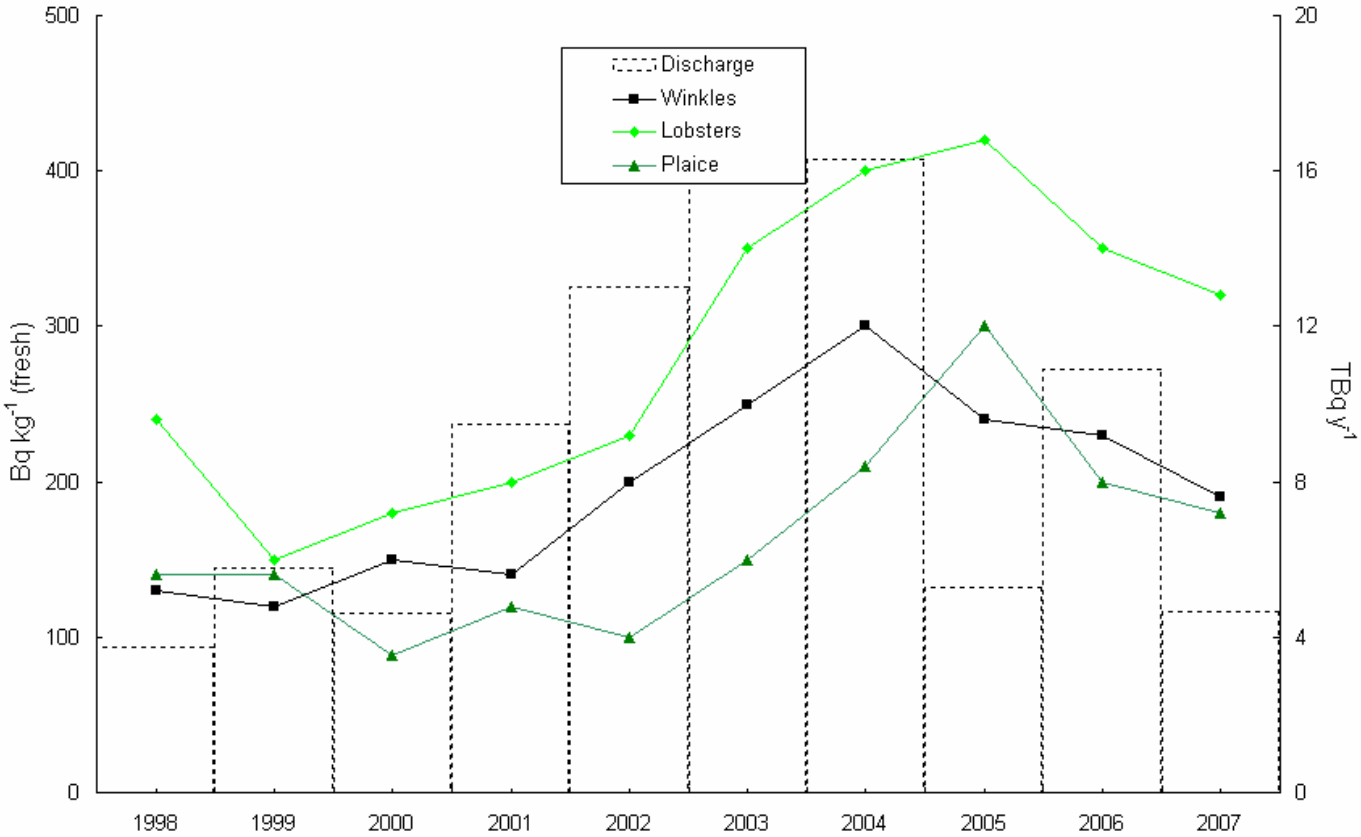

Figure 2.7 Carbon-14 liquid discharge from Sellafield and concentrations in plaice, lobsters and winkles near Sellafield

Figure 2 Carbon 14

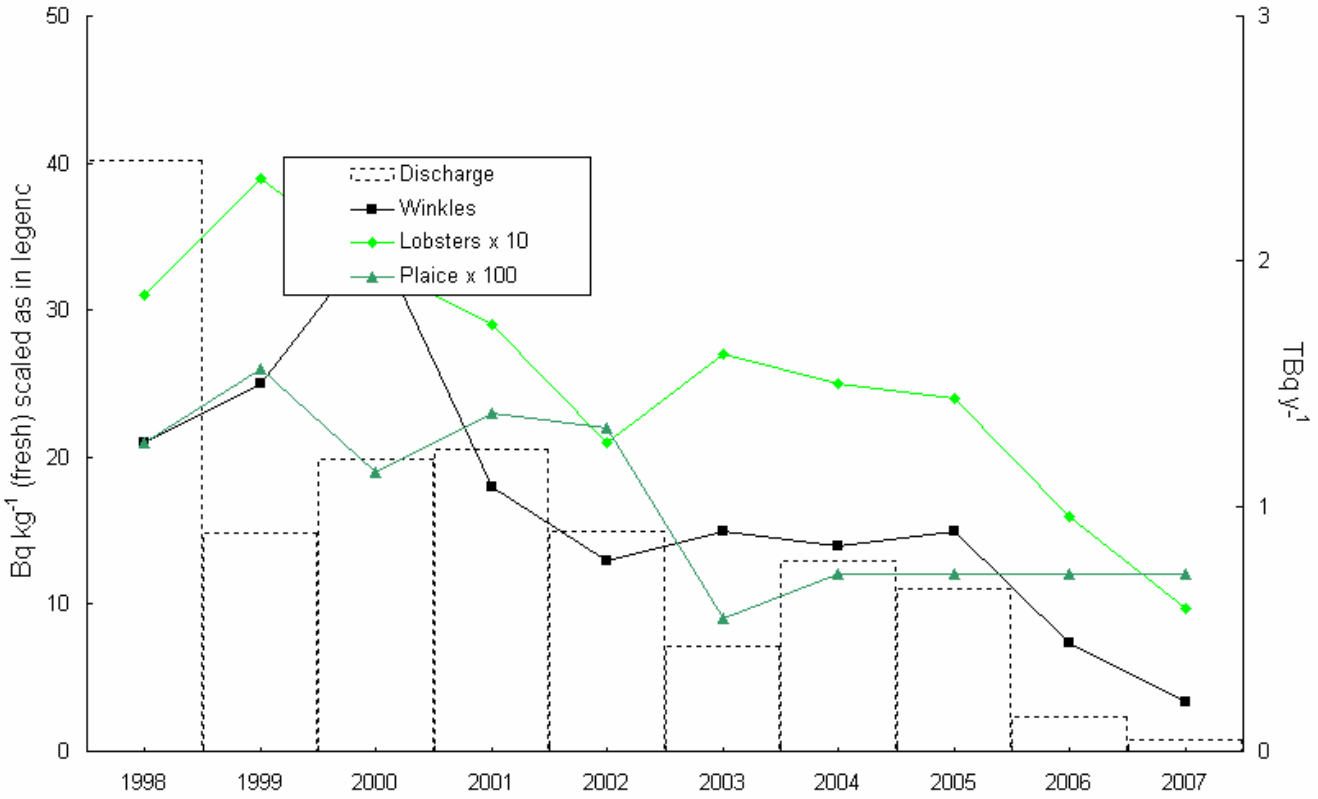

Figure 2.8 Cobalt-60 liquid discharge from Sellafield and concentrations in plaice, lobsters and winkles near Sellafield

Figure 3 Cobolt-60

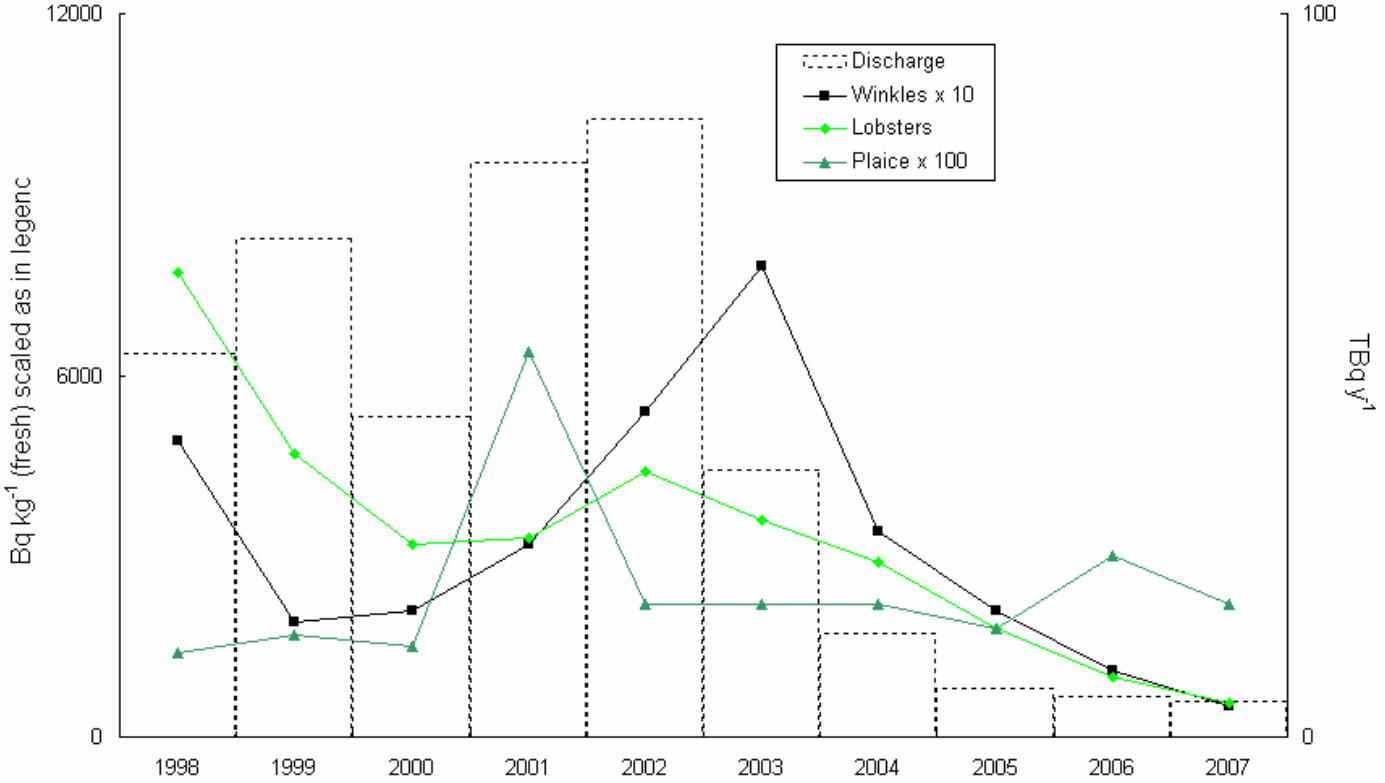

Figure 2.9 Technetium-99 liquid discharge from Sellafield and concentrations in plaice, lobsters and winkles near Sellafield

Figure 4 Technetium-99

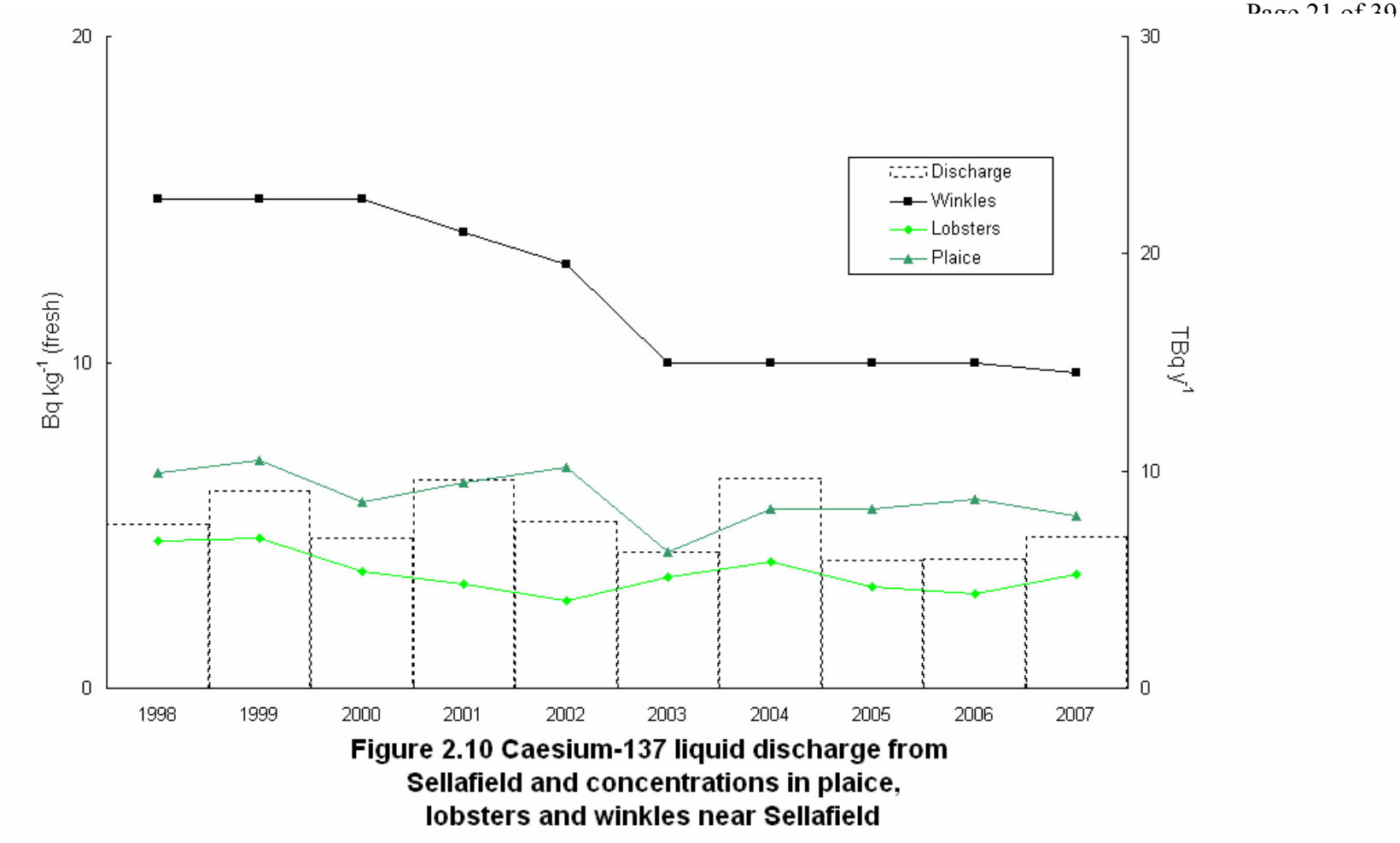

Figure 2.10 Caesium-137 liquid discharge from Sellafield and concentrations in plaice, lobsters and winkles near Sellafield

Figure 5 Caesium-137

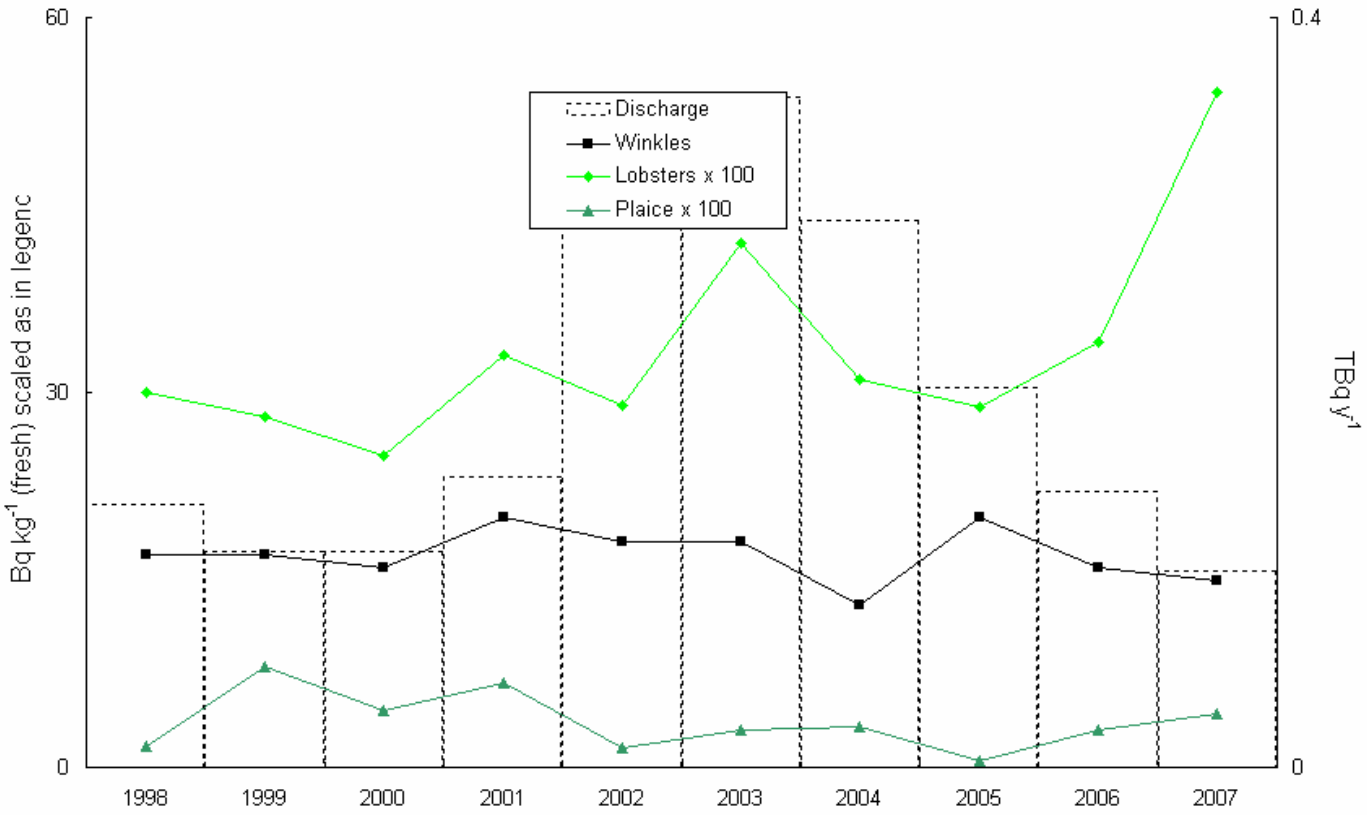

Figure 2.11 Plutonium-239/240 liquid discharge from Sellafield and concentrations in plaice, lobsters and winkles near Sellafield

Figure 5 Plutonium-239 + 240

Figure 2.12 Americium-241 liquid discharge from Sellafield and concentrations in plaice, lobsters and winkles near Sellafield

Figure 6 Americium-241

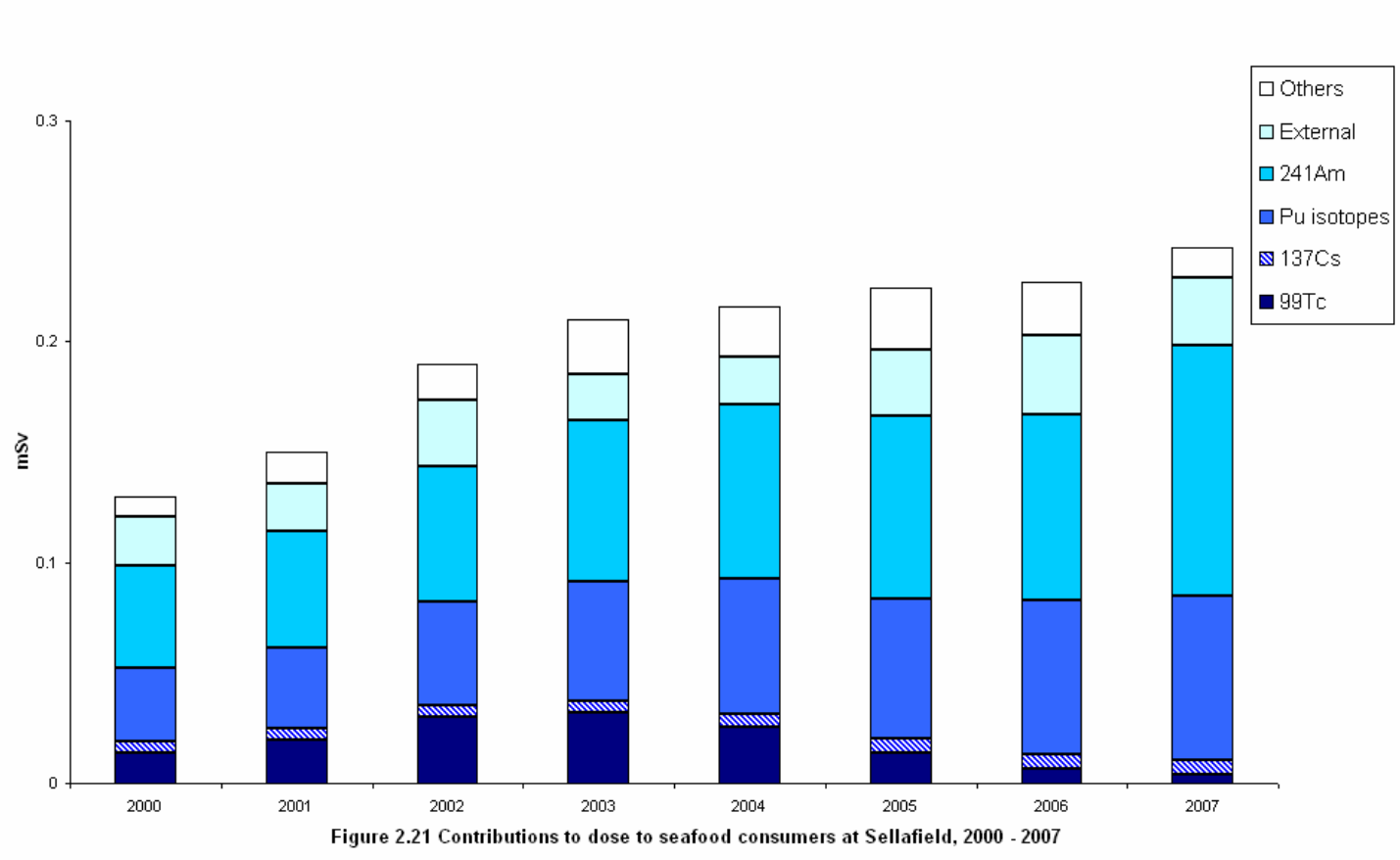

Figure 2.21 Contributions to dose to seafood consumers at Sellafield, 2000 - 2007

Seafood - Artificial dose 0.24 mSv (0.23 mSv in 2006) - Naturals 0.28 mSv (0.22 mSv in 2006) Total 0.52 mSV
Figure 7 Seafood dose assessment for Sellafield Area

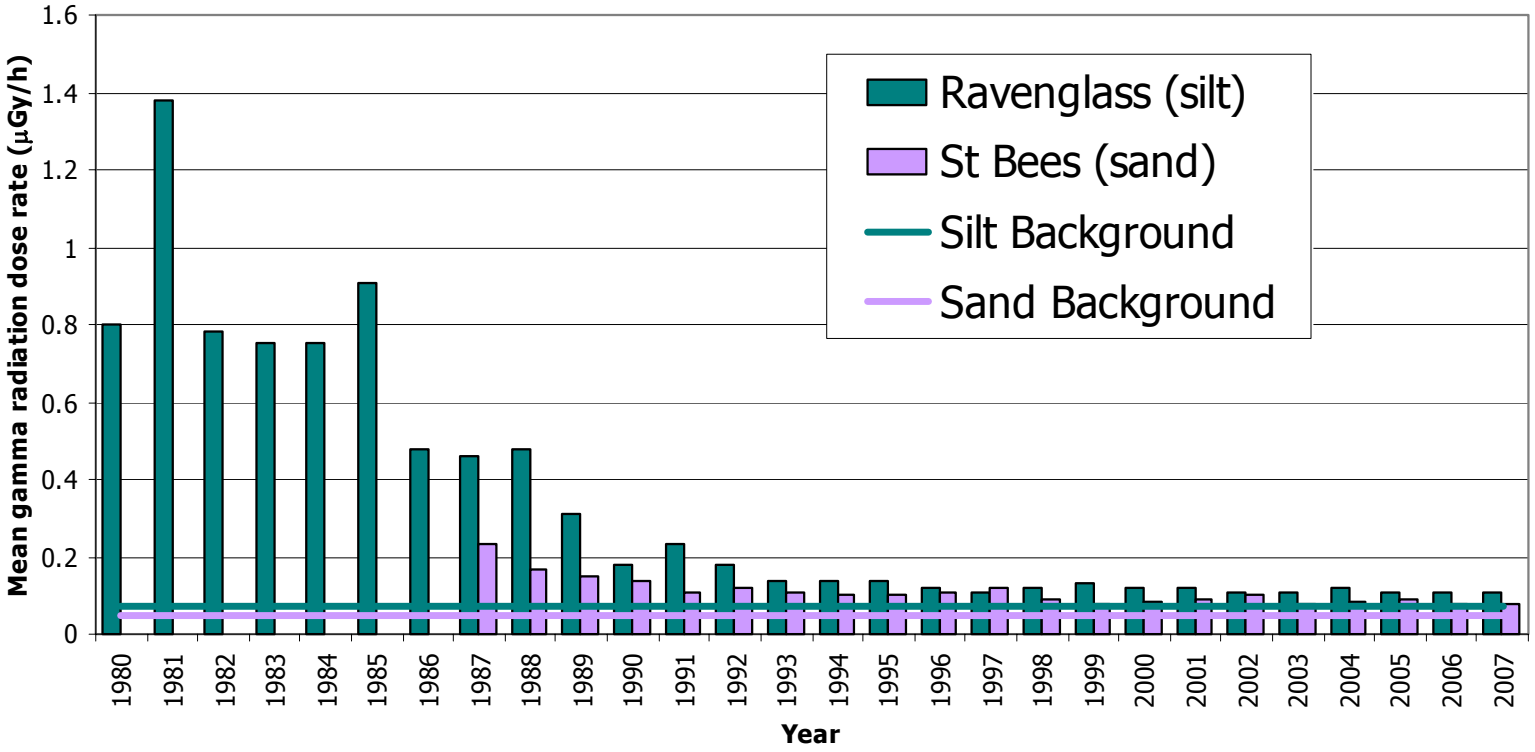

Figure 8 Dose rate trend for the West Cumbria Coast

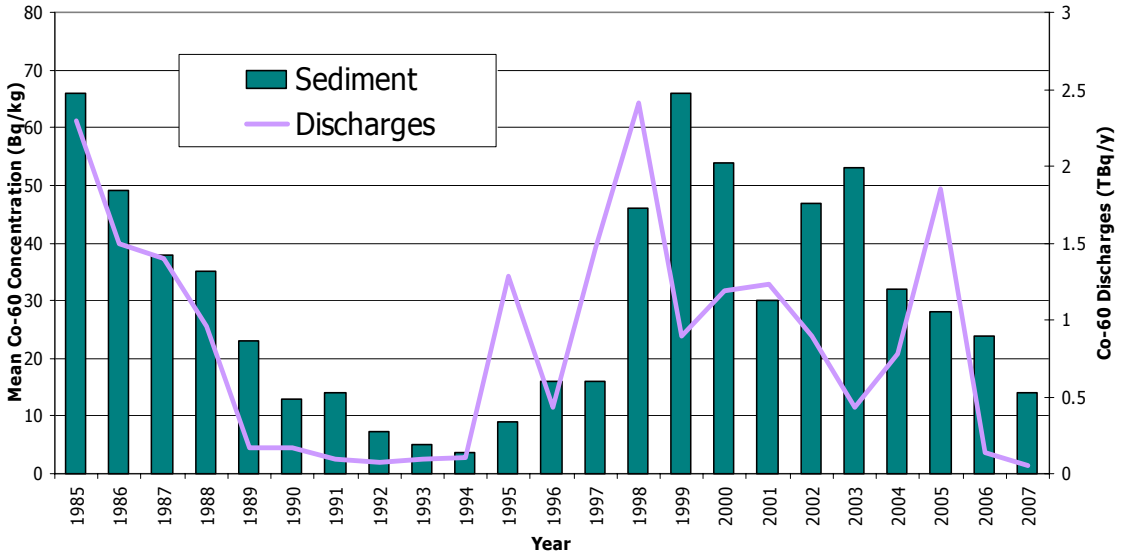

Figure 9 Eskmeals. Co-60 levels in sediments (Bq/kg) and discharges (TBq/y)

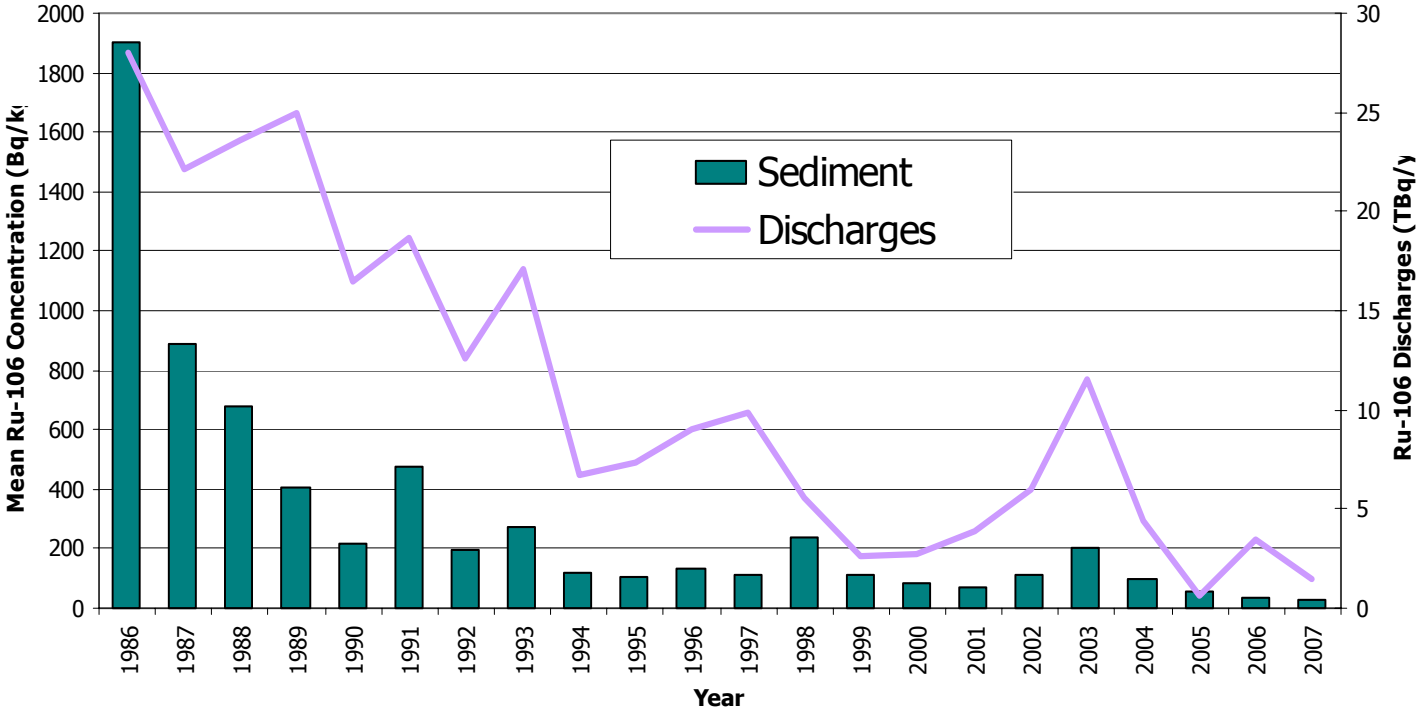

Figure 10 Eskmeals Ru-106 levels in Sediments (Bq/kg) and discharges (TBq/y)

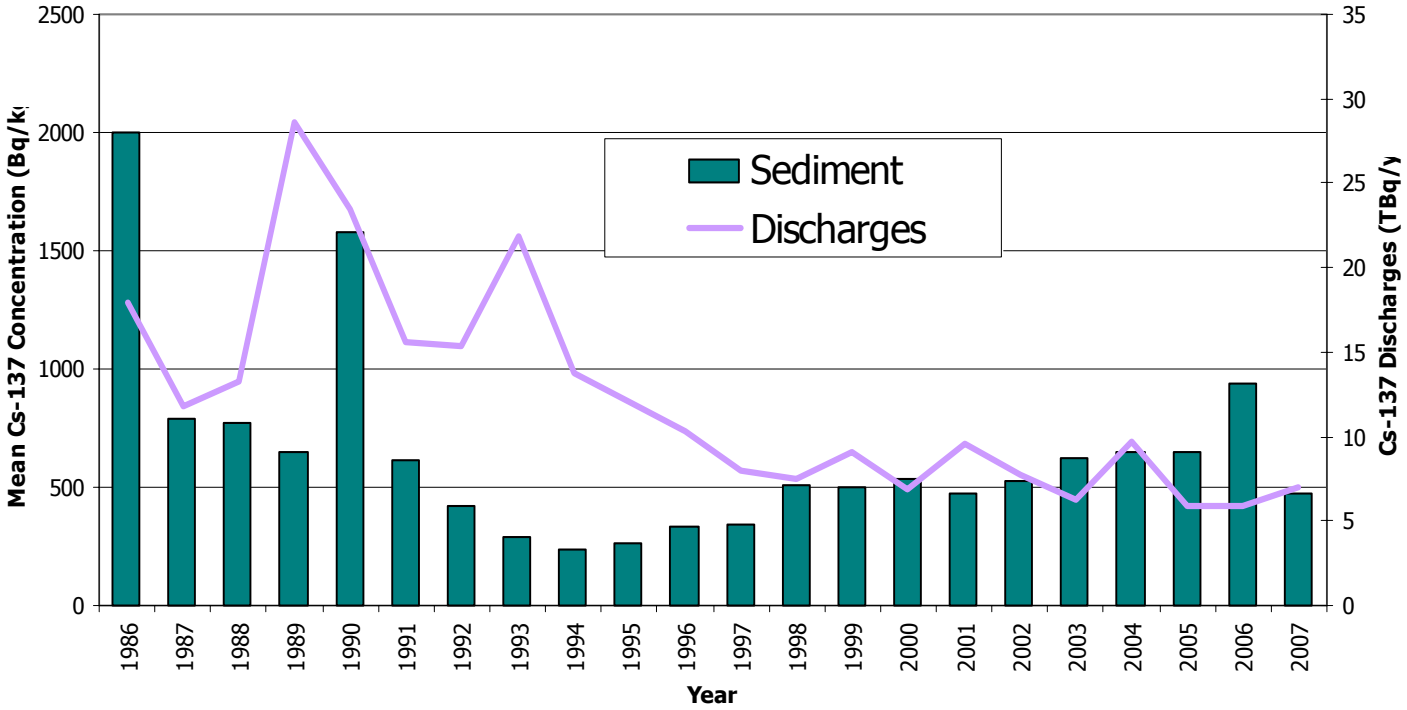

Figure 11 Eskmeals Cs-137 levels in Sediments (Bq/kg) and discharges (TBq/y)

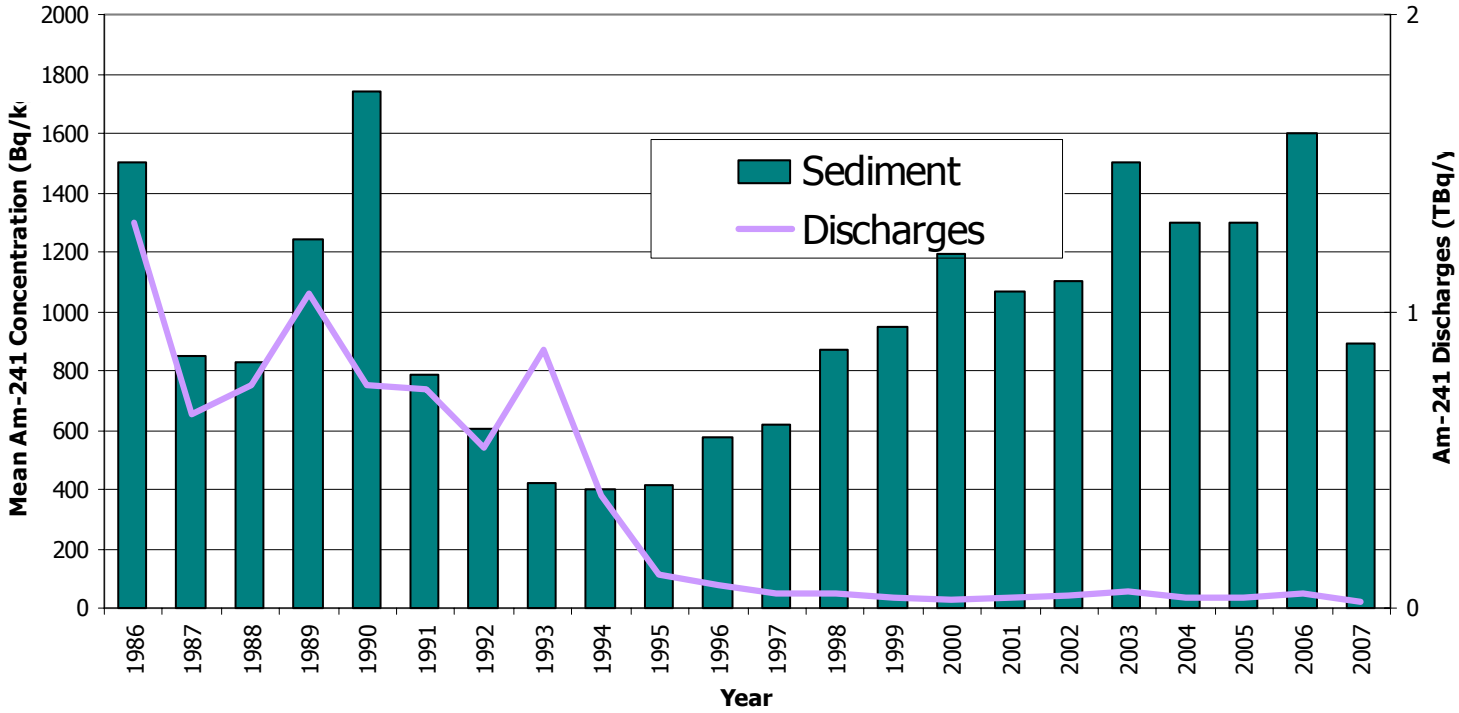

Figure 12 Eskmeals Am-241 levels in Sediments (Bq/kg) and discharges (TBq/y)

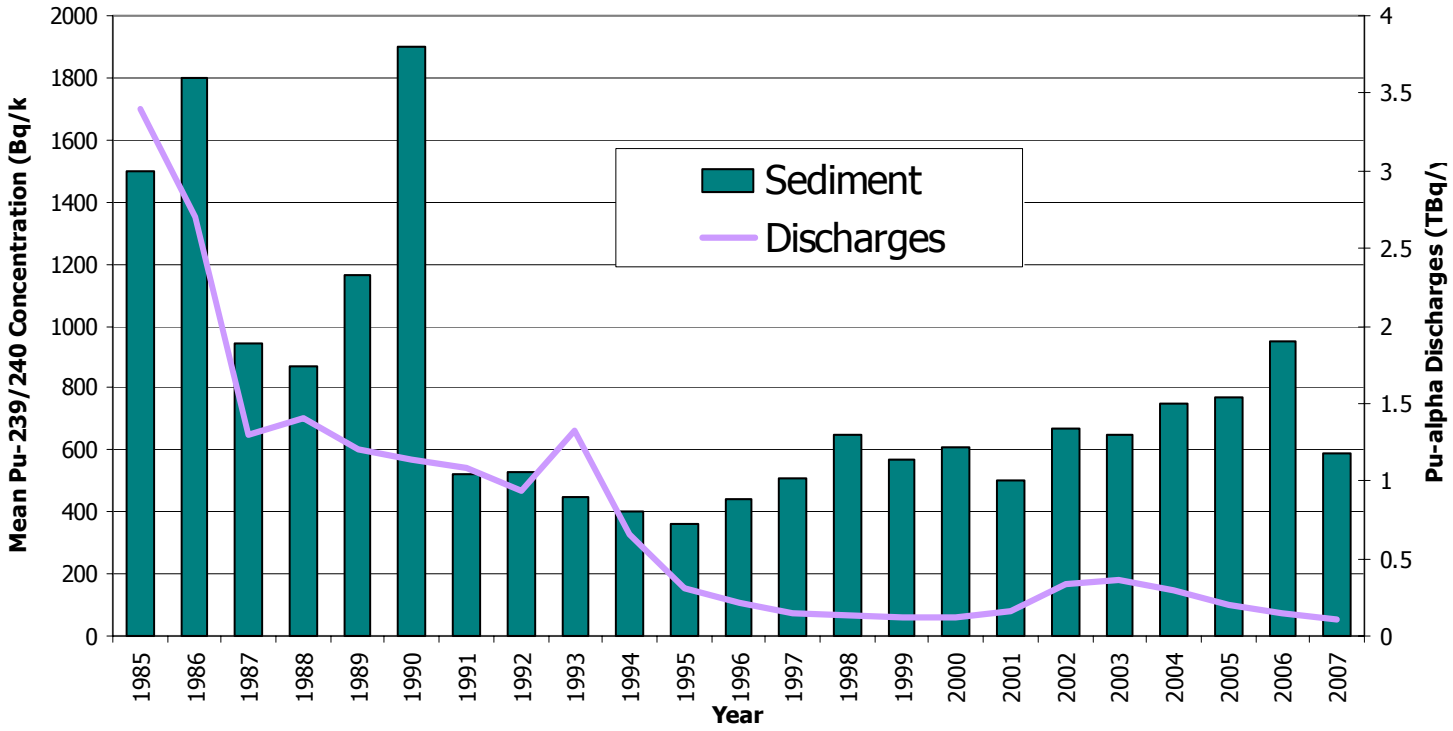

Figure 13 Eskmeals Pu-239/40 levels in sediments (Bq/kg) and discharges (TBq/y)

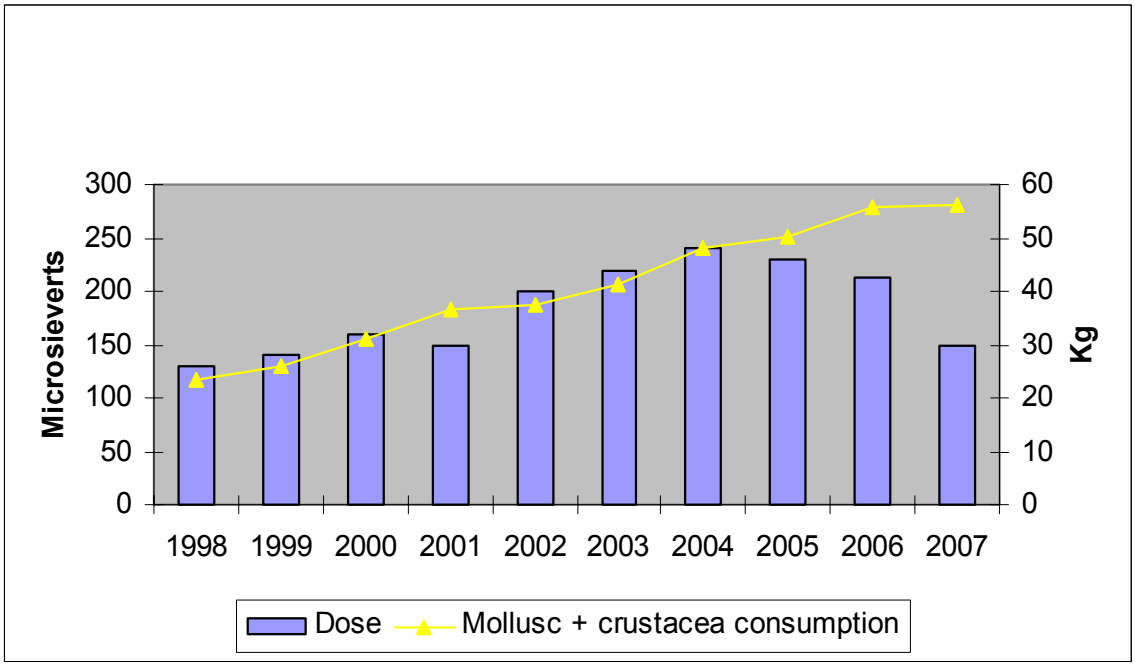

Figure 14 Dose to marine critical group (seafood consumers - total 150mSv) vs. seafood consumption

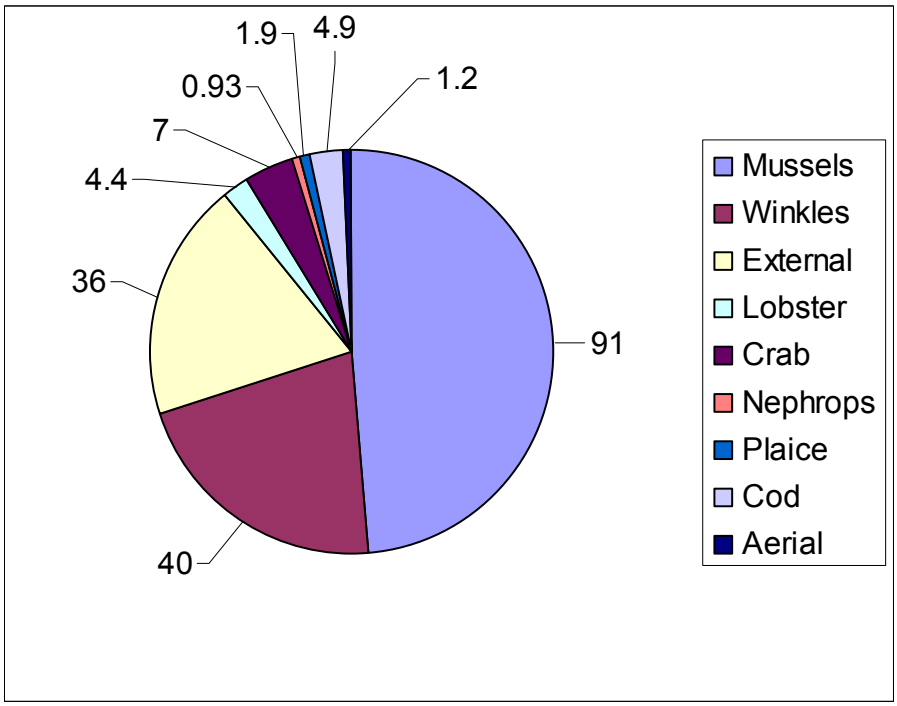

Figure 15 Pathway contributions to total dose for marine critical group (187mSv)

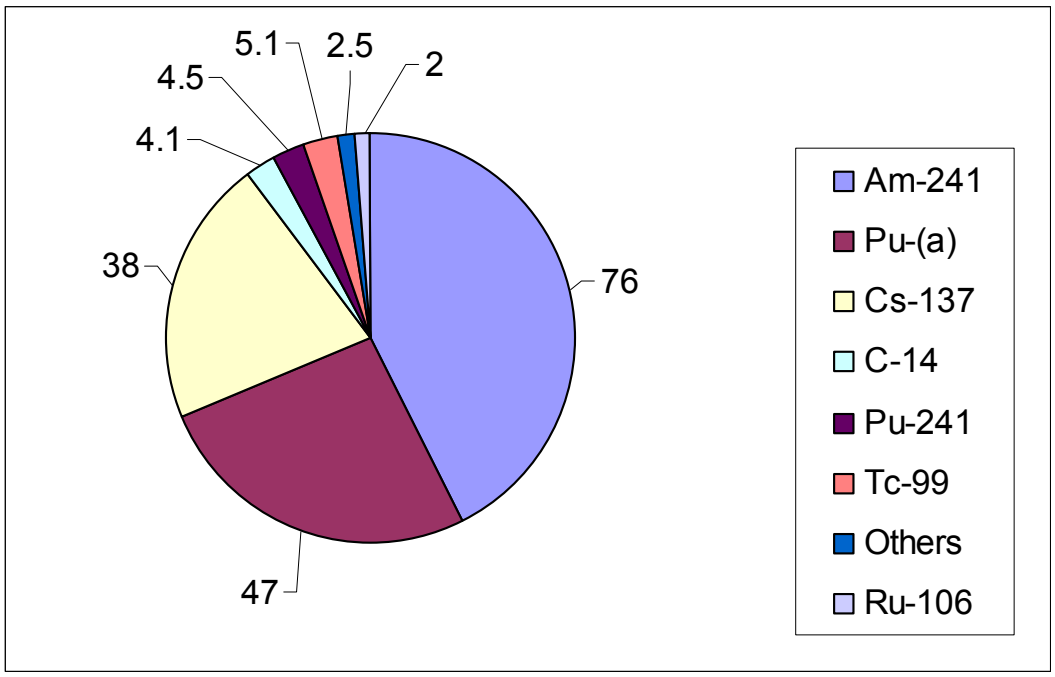

Figure 16 Nuclide contributions to marine critical group dose (seafood consumption 150mSv)

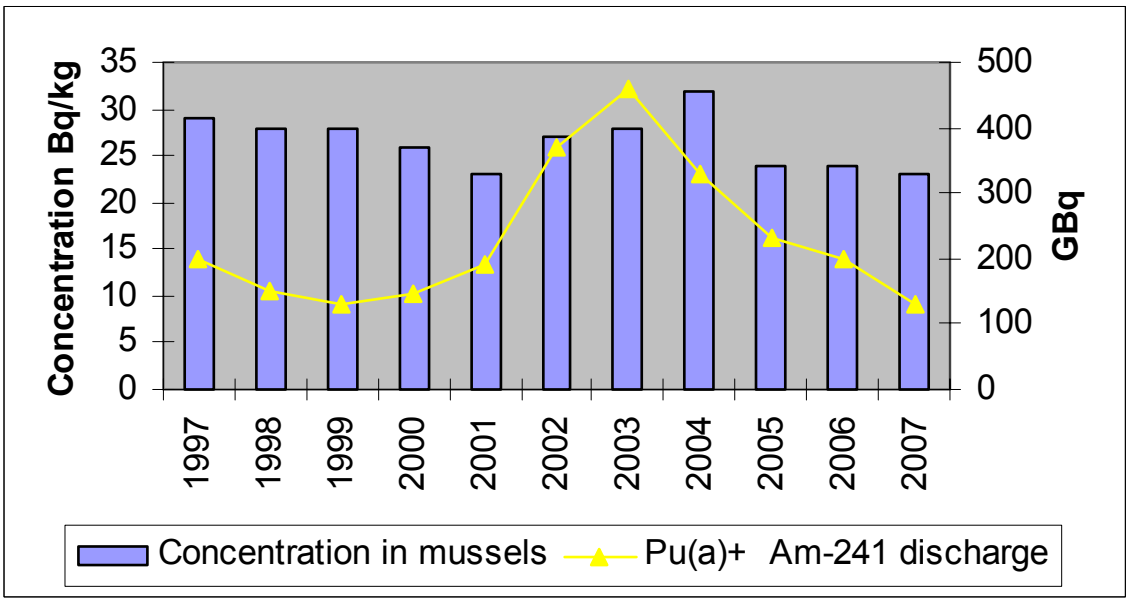

Figure 17 Concentration in mussels vs. Pu(a) and Am-241 discharges

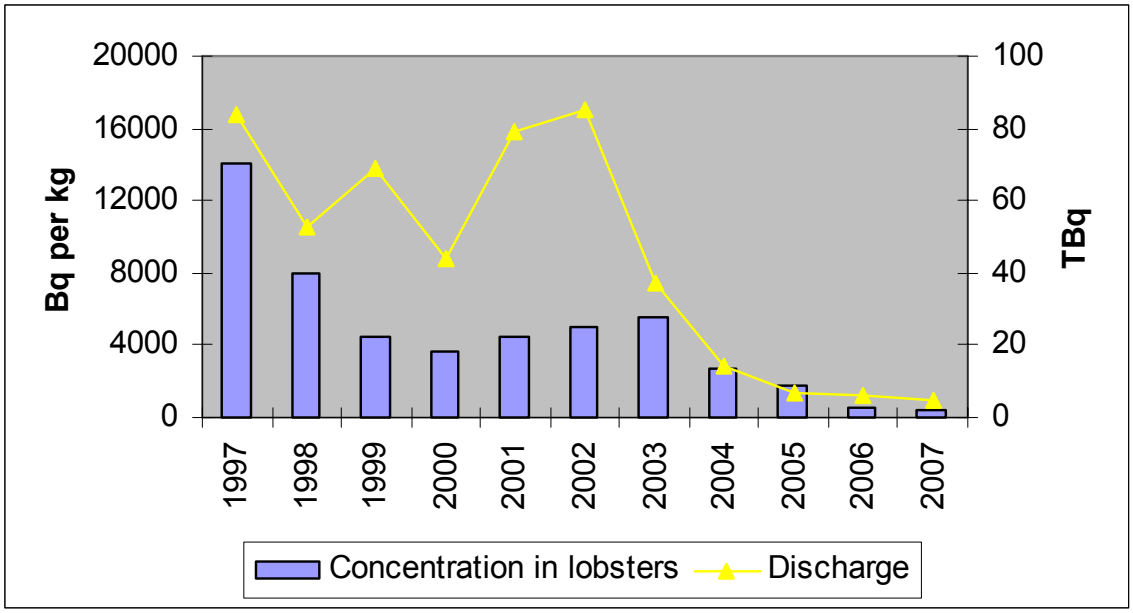

Figure 18 Tc-99 Concentrations in Lobster vs. discharges

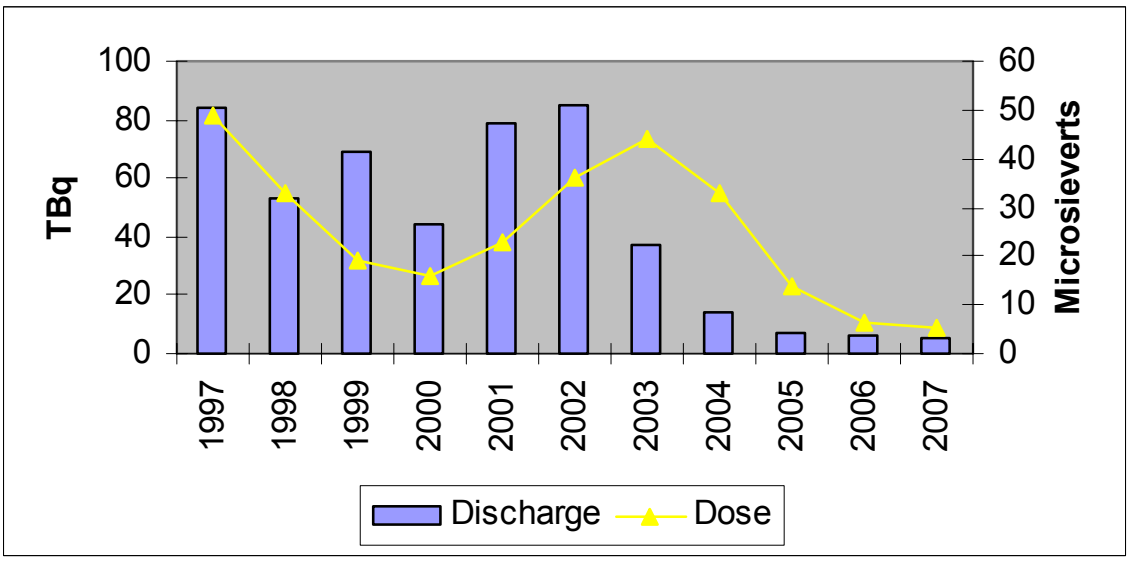

Figure 19 Dose from Tc-99 (all seafoods) vs. discharges

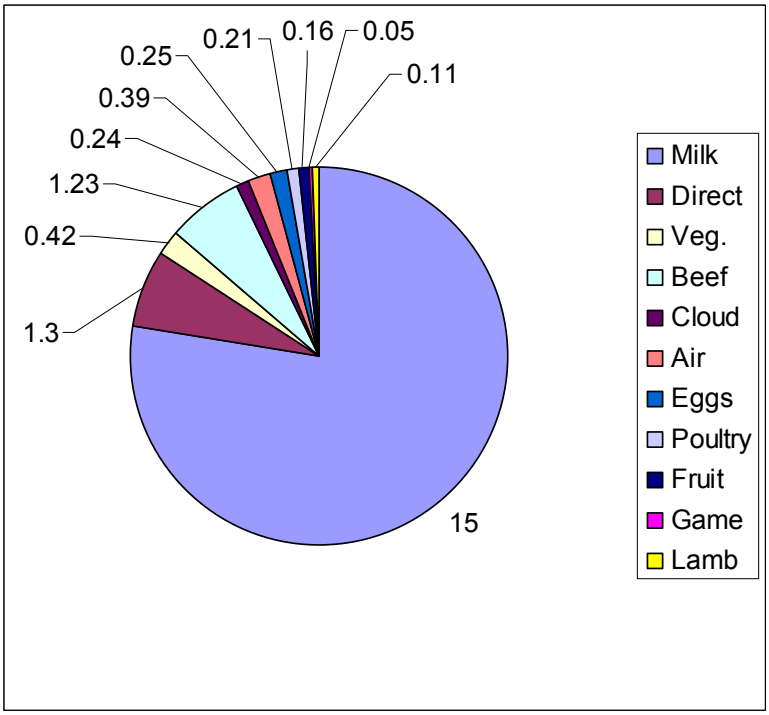

Figure 20 Pathway contributions to terrestrial critical group dose (total 26mSv)

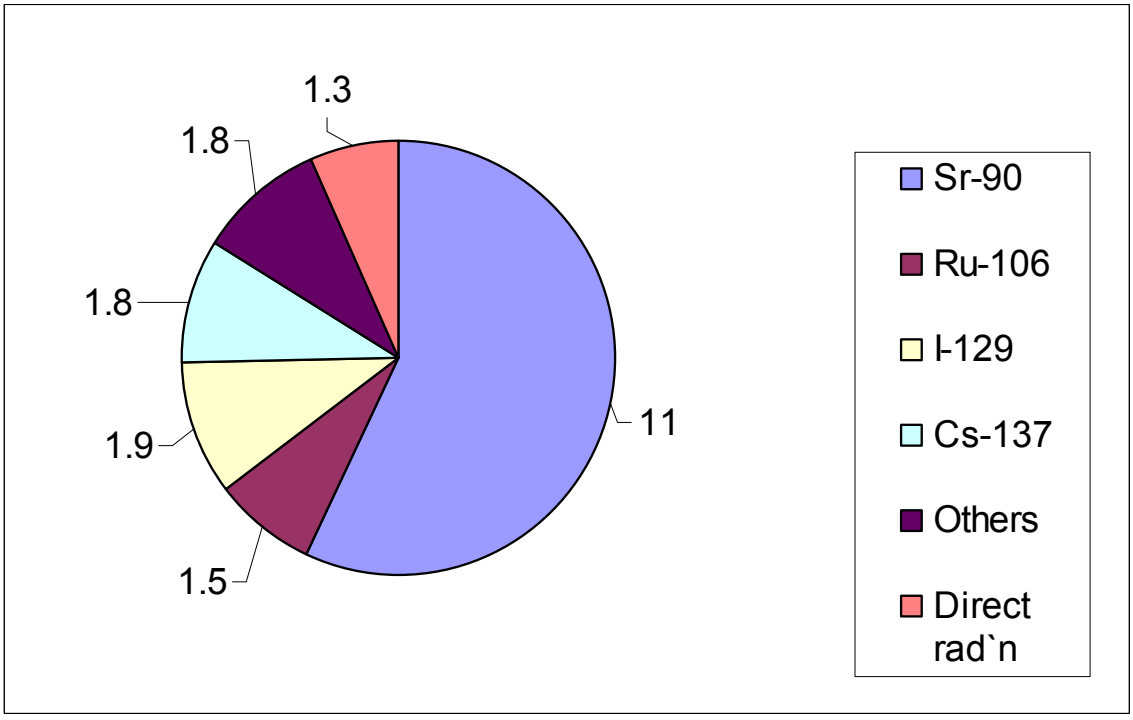

Figure 21 Nuclide contributions to terrestrial critical group dose (total 19uSv)

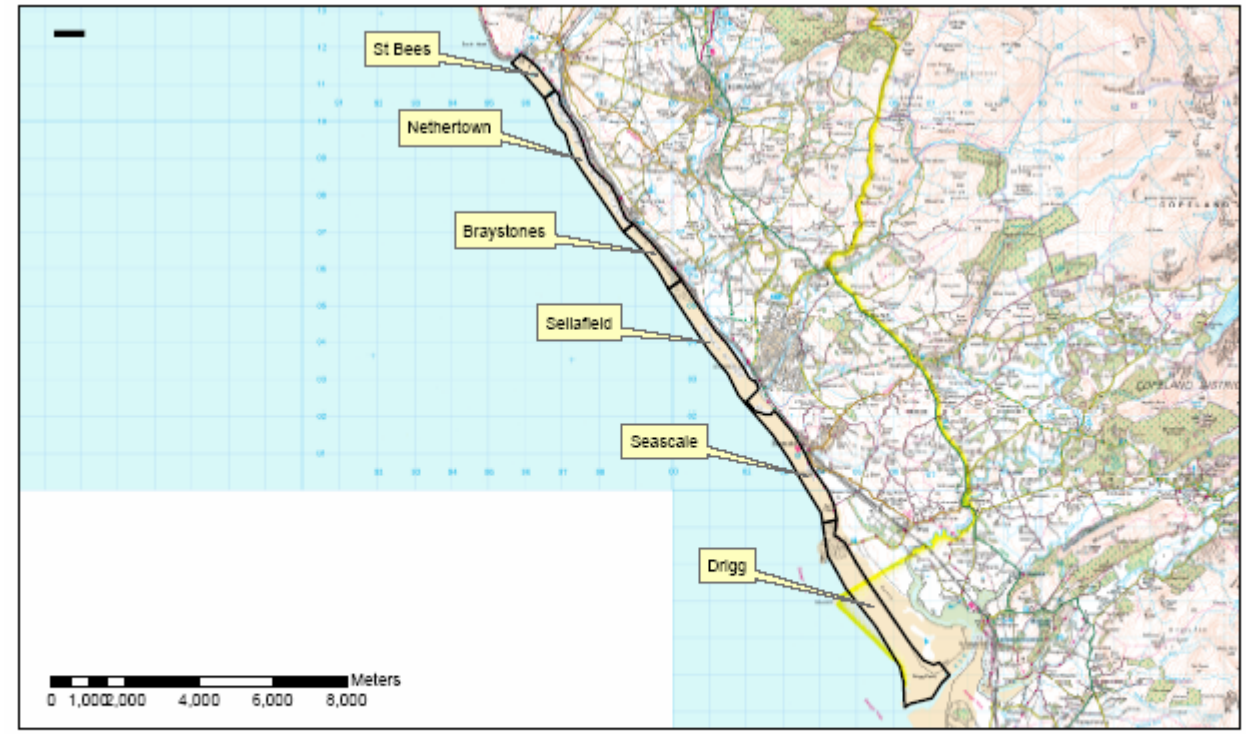

Figure 22 Beach Areas map for the 2008/09 monitoring program

Principal Radionuclide	Average Activity (Bq)	Maximum Activity (Bq)	Number of Determinations above LOD
Co60	2.21E+02	2.35E+04	28
Ru106	4.65E+02	3.64E+03	3
Sb125	2.81E+02	2.05E+03	2
Sn126	1.24E+02	1.69E+02	2
Cs134	2.89E+01	1.32E+03	15
Cs137	2.97E+04	8.75E+05	423
Eu154	1.01E+02	2.97E+02	6
Ra226	1.30E+04	1.30E+04	1
U237	1.28E+01	1.27E+02	39
Pu238	1.58E+04	8.81E+04	32
Pu239	3.35E+04	3.09E+05	37
Pu241	5.12E+05	4.97E+06	40
Am241	6.90E+03	6.34E+05	102

Figure 23 All Finds Activity Summary (For finds up to 22/10/2008)

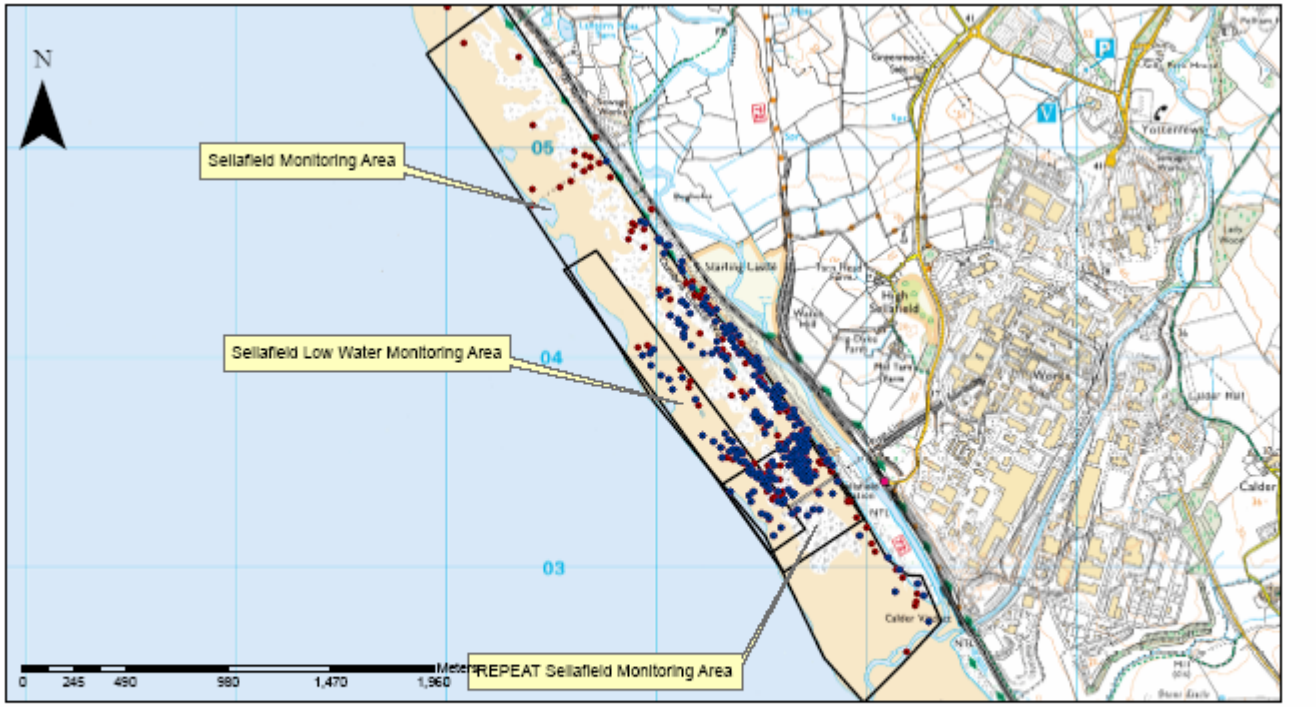

Figure 24 Sellafield beach monitoring area and locations of all finds from November 2006 to October 2008.

Press Release:

Environmental Health Subcommittee of West Cumbria Sites Stakeholder Group
27 November 2008, Civic Hall, Cleator Moor

At a public meeting on 27 November, the Environmental Health Subcommittee reviewed levels of Sellafield radioactivity in the West Cumbrian environment on the basis of the most recent reports (for calendar year 2007) from the Centre for Environment. Fisheries and Aquaculture Science [1] and from Sellafield Limited [2].

Sellafield radioactivity makes a small contribution to annual radiation doses received by individual members of the public, depending on their activities and dietary habits. Regular surveys of activities and habits are used, together with measurements of environmental radioactivity, to estimate doses for groups of consumers likely to be most affected.

Sellafield discharges are now very small compared with those typical of 30 years ago. For this reason, historic radioactivity dominates today's radiation dose estimates. From time to time, remobilisation of old sediments contributes to increased estimates of radiation dose but the general trend appears to be one of slow decline.

The highest doses reported were for a local group of very high consumers of seafood (consuming nearly 100 kilograms per year). It is estimated that in 2007, they received a dose of about 0.24 millisieverts from Sellafield radioactivity in seafood (0.01 millisieverts higher than estimated for 2006).

Discharges from the former phosphate works at Whitehaven enhance natural levels of marine radioactivity. Although the works were demolished in 2004 this enhancement continues to contribute to the dose of seafood consumers. This contribution is estimated as 0.28 millisieverts for 2007. That is 0.06 millisieverts more than in 2006 but 0.13 millisieverts less than in 2004.

These variations in doses to seafood consumers are caused partly by remobilisation of sediments containing radioactivity from earlier periods and partly by changes in seafood consumption.

Estimates of doses to seafood consumers at places more distant from Sellafield did not exceed 0.06 millisieverts. Some Ribble houseboat dwellers were estimated to have received about 0.07 millisieverts from external radiation emitted by estuary floor sediments.

All such dose estimates can be compared with 2.2mSv average UK natural background dose from natural sources of radiation.

Professor John Haywood, Chairman

1. Advance copies of the Sellafield sections of Radioactivity in Food and the Environment, 2007 (RIFE 2007) were kindly supplied by the Centre for Environment, Fisheries and Aquaculture Science. CEFAS compiles RIFE 2007 on behalf of the Environment Agency, the Northern Ireland Environment Agency, the Food Standards Agency and the Scottish Environment Protection Agency.

2. Monitoring Our Environment, Discharges and Monitoring in the UK, Annual Report 2007.

Note to Editors

The Environmental Health Sub-Committee of The West Cumbria Sites Stakeholder Group pays particular attention to the potential impact on human health of Sellafield and the Drigg Waste Management Site.

The Sub-Committee takes reports relating to the effects on the environment of operations at Sellafield and Drigg and evaluates any implications for the community.

Independent experts on this sub-committee cross reference the Site Operator's figures with those of many other sources, in order to ensure that possible risks are not overlooked. Moreover, they can pursue enquiries directly with the Site Operator and Government bodies in a highly informed way. As a consequence, the concerns of the community are always taken to the right people. The Sub-Committee continues its enquiries until a resolution is secured.

EHSC meetings are public and take place on the last Thursdays in May and November.

Minutes are published at http://www.wcssg.co.uk/ehsc.htm